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ABSTRACT

This study was conducted to help the staff of the National Academy for Vocational Education at the National Center for Research in Vocational Education to determine what methods of electronic communications technology would be feasible for providing inservice training for vocational educators throughout the country. It was determined that the use of such technologies would be helpful in order to serve more clients in more locations at lower costs, especially in a time of rising travel costs and decreasing educational budgets. The technologies addressed in the study were audiotape, telephone, radio, videotext, freeze-frame, electronic blackboard, videotape, videodisc, television, computer, and computer-based instruction. The results of this feasibility study indicate that potential clients' order of preference for a conference was (1) conference out of state, (2) teleconference in state, (3) videotape, (4) telephone conference, (5) audiotape, and (6) proceedings. Based on client preferences and the National Academy's goals for providing distance training, the following technologies were recommended for immediate adoption: a telephone lecture series supplemented with slides and question-and-answer sessions; ad hoc telephone conferences; videotapes of workshop activities and lectures; ad hoc satellite video-conferences with two-way audio for participant questions; more videotape equipment; and satellite disks to receive satellite-transmitted video conferences at the National Center. (Appendixes to the report list vendors, National Center library resources, associations, consortia, and networks.) (KC)

ED240268

Final Administrative Report: Year One
Volume II

Feasibility Study of Telecommunications and Electronic Technologies Useful to The National Academy for Vocational Education

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- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Providing information for national planning and policy
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

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FOREWORD

In an era of reduced budgets and rising costs, a logical alternative to traditional training modes is the use of telecommunications and other electronic technologies. Traditional modes of training, such as workshops, entail high travel and time costs. As the training function of the National Center, the National Academy for Vocational Education seeks to augment its well-established, highly-rated traditional training services by adopting one or more technologies for distance learning.

A feasibility study has therefore been conducted to ascertain which technologies are useful for National Academy training purposes. This study is intended primarily for use by the National Academy staff. It provides an overview of the state of the art of using various technologies for training in the educational field and describes specific technologies deemed most useful for immediate adoption by the National Academy.

The National Center thanks Dr. Mark Newton, Director of the National Academy, and Dr. Ida Halasz, who conducted the research and was the principal author of the report. Special appreciation is extended to Carol Spencer who helped develop the matrix of technologies available for training, and to Naomi Jacobs who developed the list of National Center Research Library holdings. Another staff member who was especially helpful was Carl Oldsen, who provided many insights about the current state of technologies at the National Center.

The National Center wishes to thank several experts at Ohio

State University whose help was invaluable. Dr. Bruce Matthews, Director of the WOSU Instructional Services, was exceptionally patient and helpful in explaining many satellite-related technologies. The assistance and information provided by Dr. Robert Potts and Arthur Bartfay of the Medical School were also very much appreciated.

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Robert E. Taylor
Executive Director
The National Center for Research
in Vocational Education

EXECUTIVE SUMMARY

Introduction and Purpose

As a leadership development activity of the National Center, the National Academy for Vocational Education is charged with the responsibility of providing professional inservice training to vocational educators across the nation on a cost-recovery basis. There are over one hundred thousand potential clients nationally, most of whom cannot travel to workshops, conferences, and other traditional types of training. The concomitant trends of higher costs for travel and lower education budgets, especially for inservice training activities, have induced the National Academy to investigate a third trend. This trend is the use of telecommunications and electronic technologies for distance training.

This study was conducted to assist the National Academy make the best possible decisions as it moves to embrace available telecommunication's technologies for the delivery of inservice education nationwide. Its intended leadership are management personnel of the National Center and staff of its Academy. It might also to be of particular value to the U.S. Department of Education as it seeks to serve as many vocational leaders as possible through the vehicle of the National Center for Research in Vocational Education.

Most of the increasing use of technologies for training has been geared to working with business executives, sales representatives, and clients. Most available feasibility studies have focused on the unique needs of that sector. Consequently,

there have been few, if any, studies available to help educational trainers determine which technologies would be feasible for their particular institutions' needs. Therefore a study was conducted to determine which technologies are most conducive to the unique training needs and constraints of the National Academy.

The purposes for adopting technologies to provide National Academy training to supplement the traditional modes of training delivery are--

1. to provide high quality, stimulating, state-of-the-art training;
2. to serve clients nationally, as opposed to regionally or locally;
3. to serve more clients than is now possible with traditional modes of training/communication;
4. to provide more frequent training opportunities for clients;
5. to provide training at a lower cost to the National Center;
6. to provide training at a lower cost to clients;
7. to reach clients in remote, often inaccessible locations;
8. to develop and maintain communication with a broader client base (e.g., Job Training Partnership Act administrators);
10. to save clients the time of travelling to training sites;
11. to save National Academy staff the time of traveling to training sites;
12. to reserve National Academy staff time for production and dissemination of training materials.

The technologies addressed in this study were: audiotape, telephone, radio (AM, FM, SCA), videotext, freeze-frame, electronic blackboard, videotape, videodisc, television (low power, open broadcast, cable, satellite), computer (mail, newsletter conferences, networking), and computer-based instruction. The costs for these technologies vary widely, from a few dollars to produce a master audiotape ($15-$100) to several thousand dollars to produce, telecast, and receive a satellite video-teleconference at many sites ($25,000-$85,000). The advantages and disadvantages vary as well. Some technologies are useful only on a local basis, which decreases their training usefulness for the National Academy. Other technologies can only be used by a few persons at a time, such as conferences by computers. These limited technologies would not be efficient modes for National Academy uses.

Results of the Feasibility Study

The results of this feasibility study indicate that potential clients' order of preference for a conference is--

1. attend a conference out of state;
2. attend a teleconference in state;
3. view a videotape of the conference;
4. participate in a telephone conference;
5. hear an audiotape of the conference;
6. read the proceedings of the conference.

Based on client preferences and the National Academy's goals for providing distance training, the following technologies were recommended for immediate adoption:

- o A telephone lecture series supplemented with slides and with question and answer sessions
- o Ad hoc telephone conferences to discuss timely issues as needed
- o Videotapes of workshop activities, experts' lectures, portions of conferences, and so forth
- o Ad hoc satellite video-conferences with two-way audio for question and answer sessions

Other recommendations for immediate adoption were these:

- o Purchase more and different equipment and television monitors (e.g., 3/4" VHS Compatible) to show videotapes at training sessions taking place at the National Center
- o Purchase a permanent downlink satellite dish and related equipment to receive satellite-transmitted video teleconferences directly at the National Center facility

In the near future two additional recommendations should be considered:

- o Develop computer-based software to train vocational educators
- o Establish a research and training laboratory for electronic technologies within the National Center/ National Academy

The report also contains several appendixes, including a list of vendors, National Center library resources, and a list of associations, consortia, and networks. It also contains a glossary.

CHAPTER I

INTRODUCTION

Need for a Feasibility Study

For almost two decades large numbers of vocational educators have turned to the National Center for Research in Vocational Education for inservice training and professional skill upgrading. At the National Center, the National Academy functions as the training unit. National Academy staff develop, organize, and conduct workshops, conferences, seminars, and study tours to train vocational educators across the nation. During the past five years, 1979-1983, approximately 13,253 persons have participated in some type of National Center training. The participants represented all states, the District of Columbia, and forty countries. Forty percent were administrators, 25 percent were teachers, and the remaining had varied school or community roles (Adams and Bragg 1983). Throughout these years a small staff of four to six National Academy professionals has been responsible for developing and/or coordinating the majority of these activities. The ratio of staff to participants is impressive in light of the problems typically encountered when making arrangements for training, especially at sites across the country.

When considering all the vocational educators who could benefit from inservice activities, however, a limited number have actually been able to participate. According to recent American Vocational Association estimates provided by Jim Watkins,

assistant executive director for Headquarters Administration at the American Vocational Association, at least 103,975 individuals have been identified across the nation as potential clients for professional development training. Even if the potential clients were to have funds for travel, many of them would have conflicting schedules or time to leave their work to travel to a conference or workshop. There is also the problem that a finite number of persons can be accommodated at most training activities, which means that only a fraction of those who could and would attend could actually be served.

Traditional methods of providing training, such as workshops, involve nigh travel and time costs. As the need to expand services and the cost of time and travel grow concomitantly, there is a need to seek innovative ways to deliver relevant and timely training. One logical source of alternatives is the burgeoning, ever-changing array of telecommunication and other electronic technologies currently available or in some state of development. Electronic technologies move information rather than people. Travel costs and the costs of personnel time for travel are therefore not as much of a consideration. Since there are fewer traditional time constraints, formats can be made more flexible. Business, industry, and the medical profession have already seized the opportunity to communicate with and to train large numbers of employees, other business representatives, customers, and patients through audio, video, and computer technologies. Education has also become involved, albeit more slowly and often on a smaller economic scale, in using available

technologies to provide distance learning, individualized learning, and specialized training.

While many private and public organizations are already using electronic technologies,[1] many other organizations are trying to decide which technologies to adopt and what level of commitment to make. There is no useful body of information commonly available to support decisions whether or not to embrace electronic technologies for training, especially in organizations that depend upon public funding. The complex, often confusing array of expensive technologies makes wise decision making difficult, yet critical. Purchasing and implementing costly systems and components require a substantial base of information, not only about the electronic technologies, but also about their potential to endure, to grow, and to continue to provide the type of service required by the organization in the near and distant future. It is imperative to know not only the stand-alone capabilities of the individual technologies (i.e, telephone conference, computer-assisted instruction), but also their capabilities when used in combinations (i.e, interactive video systems) and in networks that can link the National Center with other organizations. Therefore a feasibility study was

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1. Electronic technology is a relatively recent term. Other words used in the literature include information technology, educational technology, electronic media, telecommunications, and communication technology. In this study electronic technologies include cable television, radio, satellite communications, electronic blackboard, electronic mail/newsletter, videotape, computers, audio- and video-teleconferences, and other emerging state-of-the-art equipment.

included in the work for Year One of the second National Center contract cycle in order to provide a solid base of reliable information specifically relating to the delivery of National Academy training nationwide.

A feasibility study is important because it can provide information to evaluate the impact of decisions before they are made. Although a feasibility study cannot assure success of a venture, it can reduce uncertainties and consolidate relevant information (Stevens and Sherwood 1982). Typically, feasibility studies analyze information about the need for the product or services and about cost factors in the context of organizational goals and constraints. Feasibility studies regarding telecommunications address cost factors related to travel, staff time for travel, the price of equipment and services, and the price for networking and transmission. While some telecommunications feasibility studies attempt to construct quantified ratios of costs to justify adoption, most studies are more subjective and incorporate less tangible evidence. Thus, while travel savings may be an important consideration, they do not necessarily outweigh other factors such as improvement of productivity and opportunity to communicate with otherwise unreachable audiences (Telespan Newsletter 15 December 1982).

The purpose of this feasibility study is to provide the National Academy with a source of information regarding the use of electronic technologies to provide professional development training to the vocational education community. To that end, this feasibility study answers questions of particular relevance

to the National Academy. Cost factors are discussed, although the emphasis is not upon cost justification. Feasibility is assessed in light of logistical considerations, especially those related to the National Academy's operation as a cost-recovery function of the National Center for Research in Vocational Education.

Study Questions

The specific questions that guided the collection and analysis of information for this study were as follows:

1. What electronic technologies are currently available for the delivery of inservice education training? (Chapter 2)
2. What are the physical/logistical requirements of each for the sender and the receiver? (Chapter 2)
3. What are the cost factors associated with each of these? (Chapter 2)
4. What are the major advantages and disadvantages of each of these? (Chapter 4)
5. Which of these offers the most promise in terms of reaching the most people at the lowest cost? (Chapter 4)
6. What are the implications for the National Academy? (Chapter 4)
7. What recommendations are offered? (Chapter 4)

Information Sources

The information for the study was drawn from several relevant sources, including the following:

- Available literature, including: ERIC and RIVE database searches; The Ohio State University and National Center library holdings. (A list of National Center periodical holdings relevant to electronic technologies is included in appendix C.)

- National Center staff, including: Kay Adams, Sue Au-Arnold, William Ashley, Mike Crowe, Naomi Jacobs, Carl Oldsen, Barbara Kline, Jim Long, Mike Morris, Norm Singer, Ernie Spaeth, Becky Watts, and others.

- The Ohio State University faculty/staff, including: Steven Acker, Communications faculty member; Arthur Bartfay, OMEN Coordinator; Jack Culbertson, Education faculty member; Jon Hollett, Director of Continuing Medical Education; Gary Honnert, OSU Broadcasting/TV Communications; Bruce Matthews, WOSU Instructional Services Director; Leonard Nasman, Computer Graphics faculty member; Robert Potts, Director of Health Services AV/TV Center; and Lilless Schilling, Allied Health Communications faculty member.

- Professional associations and organizations, including: Warren Baise, Control Data Corporation; Kay Cunningham, Public Satellite Service Consortium; Ray Lewis, AAHE's Center for Learning and Telecommunications; the United States Chamber of Commerce; Janet Long, ASTD Resource Center; Jim Zigirelli, Instructional Telecommunications Consortium of the AACJC; and Bruce Willis, Southeastern Regional Council for Educational Improvement.

- Private-sector firms and vendors, located locally and nationally, to determine the scope of their services and the range of prices.

- Other appropriate sources, including: workshops and conferences to collect information and create a network with participants.

Contents of the Study

Chapter 1 has explained the need for a study of using electronic technologies to deliver National Academy training, the purpose of this study, and the contents of this study. Chapter 2 contains an overview of current trends influencing changes in the ways training is offered and the state of the art of electronic technologies use in business and educational organizations. A matrix provides a digest of information (e.g., description of major uses, components, production costs, and user costs) about the electronic technologies usable for training. Several technologies are further explained through illustrations and descriptions.

Next, chapter 3 examines the current use of electronic technologies at the National Center and the National Academy. An overview of The Ohio State University (OSU) facilities and services is also given. Factors that would encourage the use of additional technologies and those that would inhibit their use are examined. Specific constraints, such as sponsor restrictions on the use of media Publications and Audio Visual Advisory Council (PAVAC) clearance, are also discussed.

In chapter 4 the feasibility of using electronic technologies is analyzed through financial and logistical factors. A matrix serves as a decision-making tool to help select the best technology to meet the training purposes of the National Academy. The human as well as the financial ramifications are discussed in the context of the National Academy's mission. Recommendations are presented relative to the opportunities and constraints under

which the National Academy operates as a cost-recovery function of the public, not-for-profit National Center for Research in Vocational Education.

The appendixes contain a list of associations, consortia, information services, and networks; a list of vendors (products and services); a list of relevant National Center library holdings (current journals, books, and reports); a schedule of related national and international meetings; and suggested resources.

CHAPTER II

ELECTRONIC TECHNOLOGIES AVAILABLE FOR TRAINING

Current Trends Influencing Change

The information era Alvin Toffler (1980) calls the "Third Wave" is irrevocably changing the ways people are communicating in all facets of their lives. The availability and use of increasingly sophisticated electronic technologies for education and training is one of three concurrent trends that are influencing the delivery of training to education professionals. The other two trends are the increase in the cost of training resources and the decrease in the funds available for training. As Nesbitt (1982) points out, "Trends, like horses, are easier to ride in the direction they are already going" (p. 9).

Availability and Use of Electronic Technologies

The growing number of available electronic technologies is changing the delivery of education and training at all levels. While only seven states reported having legislation or state-level policies regarding electronic technologies prior to 1980, forty-eight states, the District of Columbia, and the territories recently reported a wide range of legislation, policies, training, and ongoing programs (Southeastern Regional Council for Educational Improvement July 1983). Further projection of this trend points to the increased use of vast information networks, stand-alone electronic technologies, and teleconferences, not only by telephone but also with computer and

satellite-transmitted video transmissions (Dimond 1983). Projection of this trend also indicates less and less reliance upon face-to-face contact between trainer and participant. Electronic technologies that defy space and time are being used, or are within the realm of possibility for use by organizations that offer training to educators.

Increase in the Cost of Resources

Perhaps one reason for the increasing use of electronic technologies is another trend, evident in all sectors but especially acute in education: the escalating cost of resources, especially for personnel and travel.

The single greatest cost in public education (85 percent of most school budgets) is the cost of teaching personnel. As in industry, the cost of human resources reaches a point when it is necessary to replace people with machines. Although the initial capital investment is high, over time it is cost-effective and more productive to use machines for some of the work once done by people. In the near future it will become virtually impossible to provide quality education and training without the use of electronic technologies (Price and Marsh 1983).

Decrease in Funds for Training

While educators usually feel that they have never had adequate resources for upgrading teacher skills through inservice training, decreasing discretionary resources at the local, state, and national levels will make this situation more pronounced than ever. By some estimates, public education will have only half of

its current financial base at the end of this decade. Public education is experiencing a long-term economic decline because of the general state of the economy and the increasing costs of repair, transportation, energy, and personnel. The tax base appears to have reached its highest level in most localities and states. Simultaneously, federal funds are being cut. Despite the nationwide demand for excellence, the public does not seem inclined to spend more on education. This attitude will probably grow more firmly entrenched as the proportion of older, retired voters increases significantly over the next twenty years (Price and Marsh 1983).

Travel for inservice education is one of the first items cut from inadequate budgets. Conscientious educators have tried to maintain their professional growth despite the severe cutbacks. It is no longer exceptional when postsecondary faculty travel to professional conferences without financial assistance. Many local public school administrators have learned to seek grant monies and use them creatively to upgrade their staff or themselves through inservice training activities. Although a sizeable number of educators are still attending national activities, there is a growing need to develop alternative ways to provide effective inservice training for those who cannot travel.

The State of the Art

In comparison to the numbers of people involved in education and training, nationally and internationally, the range of applications of electronic technology has been rather limited

thus far. The situation is changing rapidly, however, due in part to the increasing accessibility of the hardware of electronic technology (Zorkoczy 1982). Not only is there more and better hardware, its cost is decreasing steadily. While this decrease is an important factor in the decision to adopt electronic technology, the steady increase in the cost of software can be a significant deterrent. As figure 1 shows, while the cost of microcomputers, video players, and other hardware has decreased, the cost of computer programs and other software has increased. The cost of software is in the labor of experts who command high salaries and in the extensive time required for production.

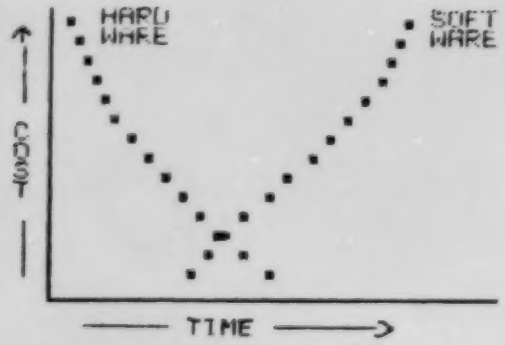

Figure 1. Relative cost of hardware and software

For example, around one hundred hours are needed to produce one hour of a good interactive computer-based instructional course that includes audio, video, and a computer program (Wright 1981).

Although radio and television broadcasting are probably still the most widely used technologies in education, the

technology that has been adopted most rapidly in United States schools is the microcomputer. Industrial training in the United States is also making extensive use of videotapes and videodiscs. The United States leads the way in the use of two-way cable television and telephone for education in remote areas. Satellite links are also being incorporated to broadcast educational programs and video-teleconferences.

Education is adopting the new technologies at a slower pace than industry. Typically, education considers adoption only when technology is robust, relatively inexpensive, and widely available (Zorkoczy 1982). Nonetheless, the interest in electronic technologies for education, especially computers, has increased dramatically in the last two years. In 1981, Electronic Learning magazine conducted a survey of all fifty state education agencies to ascertain state policies and programs related to computer literacy. The results indicated very little activity, although there was a growing interest. Only Florida had a policy related to computer literacy while the activities in other states were limited to needs assessments and surveys of computer use in local school districts.

A similar but more broadly focused survey conducted by the Southeastern Regional Council in 1983 showed a remarkable change. With the exception of two states that did not respond, all state education agencies indicated that they are engaged in some formal activity related to electronic technologies. Fourteen states have passed legislation; twenty-three have state wide offices or

divisions; over half have state-level task forces, commissions, clearinghouses, committees, or position papers. Nineteen states have staff positions for computers/technology. Virtually all of the states reported using the technologies for training local educators (e.g., audioconferences), and/or training them to use technologies such as microcomputers, instructional television, or electronic mail. At least twenty-one states have published guidelines to help local educators use the technologies for educational or administrative purposes. Examples include Missouri's Selecting Hardware and Software for Instruction (1982) and Kansas' quarterly Technology in Education bulletin. Aside from being used within the states, the new technologies have been used extensively in improving intrastate communications as well. The uses of electronic mail, electronic newsletters, audio- and video-conferences were cited frequently (Southeastern Regional Council 1983).

Another survey, conducted in 1981 by Parker and Olgren at the Center for Interactive Programs at the University of Wisconsin-Extension, focused on teleconference applications used in 147 organizations across the country (Telecoms Newsletter January 1982). The survey, which included only organizations that have incorporated teleconference use (audio, audiographics, freeze-frame video and full-motion video) into the organization on a regular basis, listed fifty-five educational institutions. Of these, twenty-seven (44 percent) use audio-teleconferences, eleven (18 percent) use audio and audiographics, eighteen (29

percent) use freeze-frame video, and six (10 percent) use full-motion video. Most of these institutions use teleconferences for continuing professional education or formal instruction.

The organizations surveyed stated four main reasons for using teleconferences: (1) to measure or improve communications; (2) to provide more educational opportunities more conveniently; (3) to reduce travel cost; and (4) to reduce travel time so that staff could be more productive. The organizations reported that using teleconferences has been cost-effective. In one organization, for example, teleconference use saves an average of $1,000 in travel costs per hour of use. Another organization claims $3 million saved in travel costs over a two-year period. In general, the organizations reported positive user reactions to teleconferences, listing benefits such as faster communication, convenience, and improved productivity. A few (14 percent) of them listed problems such as excessive audio noise or poor video resolution, inadequate user training, inconvenient room locations, funding, resistance by staff to changes in meeting behavior, and resistance by staff and users to teleconferences as a travel substitute. For the most part, reactions were positive, with organizations citing plans for expansion of their current systems or for adding new capabilities like video transmission or reception (Telecoms Newsletter January 1982).

Yet another survey, sponsored by the Center for Training and Telecommunications, focused specifically upon the use of telecommunications at the postsecondary education level and identified

seventy noteworthy programs in operation for at least a year (Lewis 1983). An important criteria for inclusion in the study was that a description of the programs would provide information to other institutions about unique approaches to solving the problems of offering education at a distance. While not a random sample, the programs represent a broad range of organizations as shown in table 1. The majority of the programs (84 percent) serve a single locality or state. Of the remaining programs,

TABLE 1

TYPES OF ORGANIZATIONS SURVEYED BY THE CENTER FOR LEARNING AND TELECOMMUNICATIONS

Organization	Number	Percent
Two-year colleges	14	20
Four-year colleges/universities	28	40
Consortia (local and state)	8	11
Consortia (regional and national)	8	11
Broadcast facilities	5	7
Community-based organizations	1	1
Government agencies	2	3
Professional associations	2	3
Nonprofit organizations	4	6
Totals	70	100

6 percent serves multistate areas while 10 percent has a national scope. The latter group consists of seven associations, consortia, and networks.

About a third of the programs provide professional continuing education, although the majority provide undergraduate level education (64 percent) and adult continuing education (76 percent). The survey findings indicated that when it comes to educational applications of electronic technologies, professional continuing

education is the fastest growing and most competitive area. Since many professionals are required and/or encouraged to stay current in their fields and are likely to be relatively affluent, many organizations are competing to reach them for distance learning through electronic technologies.

The types of electronic technologies used in the programs surveyed by Lewis (1982) are shown by categories in table 2. As shown in table 2, the most prevalent technologies are telephone (93 percent), videotape (79 percent), and open-broadcast (50 percent) and cable (49 percent) television. Audio-teleconferences has been one of the most cost-efficient technologies for serving learners dispersed over large geographic areas. None of the schools in the survey use two-way video-teleconferences technology. There are, however, a number of recent examples of

TABLE 2

TYPES OF ELECTRONIC TECHNOLOGIES USED BY PROGRAMS IN THE CENTER FOR LEARNING AND TELECOMMUNICATIONS SURVEY

	Noninteractive			Interactive		
		Number	Percent		Number	Percent
Audio	Radio	18	25	Telephone	65	93
	Audiotape	29	41	Audio-Teleconferences	15	21
Video	Open-broadcast TV	35	50	Microwave TV	5	7
	Cable TV	34	49	Cable TV	4	6
	Videotape	55	79	Slow-scan/freeze-frame TV	1	1
	Instructional TV	15	21	Electronic blackboard	1	1
	Satellite TV	4	6			
	Slow-scan/freeze-frame TV	2	3			
Computer				Computer-based instruction	11	16

satellite two-way video-teleconferences provided by educational organizations. These include: "Microcomputers in Education" by the College of Education at The Ohio State University (1982), "Nationally Validated Projects" of the National Diffusion Network by the Nebraska State Facilitator Project (1983), and "Telecommunications Conference for Economic Development" by the Oklahoma State Department of Vocational and Technical Education (1983). A growing trend is to combine two or more technologies in order to shape the educational delivery system to suit specific needs. Another trend is to integrate interactive technologies (e.g., audio-teleconferences) into delivery systems that rely primarily on noninteractive technology (e.g., cable TV).

The programs surveyed are funded in a variety of ways. Many are self-supporting, based on tuition and on income from the lease or sale of course materials to other institutions. Several programs have been awarded grants. The following are among the granting agencies:

- Alfred P. Sloan Foundation
- Appalachian Regional Commission
- Carnegie Corporation of New York
- Department of Labor
- Fund for the Improvement of Postsecondary Education
- Kellogg Foundation
- National Endowment for the Humanities
- National Telecommunications Information Administration
- Office of Telecommunications Demonstration (U.S. Department of Education)
- Title III of the Higher Education Act

Several future impacts of electronic technologies on postsecondary education are described by the survey's director/author, Ray Lewis (1983). He foresees that--

- organizations serving learners dispersed over large geographic areas are most likely to take advantage of these options in the face of rising energy costs and funding constraints;

- electronic links between universities and industries are likely to be much more common;

- instruction by independent study is likely to increase. Much larger and much smaller groups of learners will be served cost-effectively by using various combinations of electronic and print media;

- competition from the for-profit sector will make substantial inroads into the professional continuing education domain;

- collaborative arrangements among educational institutions are more likely to be based on shared concerns rather than geographic proximity;

- the electronic technologies most likely to persist are those that pose the least threat to traditional faculty roles (e.g., audio-teleconferences);

- most institutions are likely to integrate their audio, video, and data communications into a single system that combines administrative, instructional, and research functions.

In summary, this overview has provided a brief review of several national surveys. Descriptions of the survey results have endeavored to depict the changing state of the art of the application of electronic technologies to training and education. Typically, business and industry are far advanced in comparison to education in the use of the technologies to communicate and provide training. A number of educational organizations are, nonetheless, using electronic technologies for distance learning and for supplementing more traditional training approaches. Forecasts indicate that the use of technologies will continue to increase as travel and faculty costs rise and the demand increases for continuing professional education.

Technologies Useful for Training

A comprehensive search of the literature, primarily current periodicals, and data provided by experts yielded an overwhelming amount and array of information about electronic technologies. Although several typologies of electronic technologies were found, none focused on those that would be most conducive to training activities. Consequently, a matrix (table 3) of the most viable technologies for training activities has been developed. Inclusion in this matrix does not, however, indicate that every one of the technologies is perceived as usable by the National Academy at this time, or in the near future. (Another table is included in chapter 4, which addresses the technologies' feasibility for use by the National Academy.)

The matrix includes both noninteractive (one-way) and interactive (two-way) technologies that are categorized as audio only, video only, audio and video, or computer. The prices are the most recent available and are quoted from OSU or local vendors when possible.

TABLE 3

TECHNOLOGIES USEFUL FOR TRAINING

Name and Description	Training Applications	Components	Production Costs	User Costs	Advantages	Disadvantages
AUDIO ONLY						
AUDIO TAPE Recorded speech to be played back on individual tape player at the listener's convenience.	• delivery of instruction • reproduction of conferences, speeches, etc. • often used with accompanying printed	• tape recorder/player • tape duplication/ editing facilities and equipment	• $25-90/hr • $0-40/hr	• purchase ($20-up) tape player • purchase or rental of tapes • printed support materials	• inexpensive production and user costs • easily portable • individual use controlled	• learners prefer interaction • must listen to whole tape rather than portion in most cases
TELEPHONE Speech communication over existing cables. Individual or group conversations, usually in a conference/meeting mode.	• conferencing • short notice information exchange • linking an individual or group to a traditional classroom/ workshop activity	• telephone • speaker phones • loud speakers	• telephone hookup • $0 - ? for cost of speaker phone • long distance telephone charges	• telephone hookup rental • special speaker phone charges • long distance telephone charges • purchase of loud speakers	• national availability of telephone • relatively inexpensive • requires short planning time	• new user discomfort • need some special equipment setup • graphic material must be sent by mail or by electronic blackboard
RADIO (AM & FM) Use of existing commercial and noncommercial stations to broadcast at predetermined times.	• delivery of instructional programming for credit/noncredit • service delivery to widely dispersed populations	• radio broadcast facilities • radio	• WOSU - $30/hr plus supplies • $25 - $90	• cost of radio • cost for printed support materials	• inexpensive for user • works well for widely dispersed populations • easily accessible	• not always easy to adopt instruction to audio only • learners prefer video and interaction • cannot limit audience
RADIO (SCA) Radio broadcast on special FM frequencies for reception on subsidy carrier authorization (SCA) receivers at predetermined times.	• delivery of reading services for the blind	• FM broadcast station with SCA capabilities • SCA receiver radio	• WOSU - $30/hr plus supplies plus SCA lease $40,000/yr	• receiver rental or purchase cost • may be printed on braille support materials	• inexpensive for user • good for special populations	• audience limited to those with SCA
VIDEO ONLY						
VIDEOTEXT A service similar to teletext except that information is delivered by telephone channels and a user can interact with the data base to selection information for viewing.	• information services announcements • low cost publicity	• television • service provider within range • two-way cable hookup or home computer with a modem		• subscriber fee based on number of services, type of service or time usage • range $20 year to to $5 hour	• subscriber has access to larger number of databases • user in complete control of incoming information	• not always available

TABLE 3 (continued)

Name and Description	Training Applications	Components	Production Costs	User Costs	Advantages	Disadvantages
VIDEO ONLY						
FREEZE-FRAME Also called slow-scan video. A device that transmits and/or receives still video pictures over a narrow-band telecommunications channel.	• one way to accompany audio conferencing • UPI delivers 24 hr newsprogramming to cable TV	• television monitor • telephone hookup devices • television camera scan converter	• relatively low cost range $100-$350/hr broadcast	• broadcast costs may be split by service provider and user	• high availability • low psychological threat to user	• needs graphics, charts, etc. for meaningful use—not good for "lecture" transmission
ELECTRONIC BLACKBOARD A device that looks like an ordinary blackboard but has a special conductive surface for producing free-hand information that can be sent over a telephone line.	• transmission of graphic portions of instructional presentations as part of teleconference	• electronically sensitive to write information upon • monitors or television sets • telephone hookups	• very low once equipment is acquired	• lease equipment from telephone company • typically refers to the Bell system's Gemini 100 Electronic Blackboard	• inexpensive • easy to use	• doesn't work well with nongraphic presentations
AUDIO AND VIDEO						
VIDEOTAPE Recording of video and audio on tape that can be replayed at user convenience. Can be captioned with a character generator.	• courses • workshops • speeches • pair with computers for interactive use	• character generator (optional) • VTR and monitor • editing equipment	• approximately $1,000/hr of tape	• leasing or purchase costs ($25 to $1,000)	• can be used frequently at the user's convenience • cost effective	• straight lecture is boring • many types of equipment, e.g., BETA
VIDEO DISC Information in microscopic "pits" indented into the surface. Provides a high-capacity storage medium of over 50,000 frames of information used to store and retrieve video, audio and other information.	• combined with computer technology can be interactive educational system • text and movie storage • course delivery	• video disc recorder/player • video discs from commercial suppliers	• custom disc $250,000, convert video tape to a video disc $2300 – $3000	• video disc player $1,000 and up	• random access • ease of use	• many types of technology not interchangable • cannot make changes in disc

TABLE 3 (continued)

Name and Description	Training Applications	Components	Production Costs	User Costs	Advantages	Disadvantages
AUDIO AND VIDEO (continued)						
TELEVISION (LOW POWER) Standard television broadcast by lower powered translater station, using very weak signals (1,000 watts of power).	• local and rural programming • ethnic programming	• standard television broadcast and receiving equipment	• same as standard television	• little or no cost	• local control of programming	• broadcast times inconvenient • high cost of programming • government regulations and red tape on licensing
TELEVISION (OPEN BROADCAST) Commercial and public broadcasts using microwave signals received by towers and relayed to home receivers.	• courses • workshops • conferences • entertainment programming • can be copied on video tape for future showing	• television set • receiving antenna • production facilities	• a three-unit half-hour course would cost approximately $6,000 to $12,000 to produce	• user access is free • when students register for credit a fee is charged (e.g., $100/credit hour)	• wide acceptance and usage	• only local programs • lack of personal interaction • programming not always at convenient times
TELEVISION (CABLE) Television connected to service receivers by a single or double wire cable, available to those with access to cable delivery.	• courses/workshops • public announcement services • replay programming from open broadcast television	• television set • cable selector unit • cable transmission firm with access cable laid	• $4,000/mile to lay cable	• subscriber fees to cable service (e.g., $25/mo) • possible rental charges for programming	• more channel availability than general broadcast	• only local programs • not always available
TELEVISION (SATELLITE) Satellites (at least 16 domestic commercial satellites) that reflect transmitted microwave signals to ground receiving stations.	• courses/workshops/conferences • used with telephone for interactive conference	• television or wide screen projection • receiving dish (downlink) • sending dish (uplink) • access to satellite	• approximately $17,000 to $25,000 to produce 1/hour telecast	• little or no cost for regular broadcast • participant charges for teleconference • $400 to $1,500 /site	• wide area covered by satellite, therefore, distance insensitive	• sometimes difficult to access satellite • cost is high
COMPUTER						
COMPUTER-BASED MAIL/NEWSLETTER Information sent over telephone lines from one computer to another. Can be stored or used to interact in real time.	• newsletters • memos and letters • conferences	• minicomputer or microcomputers • software • telephone line access	• $3,000 - $4,000/mo for subscription • $5,000 to install a system	• subscriber fee and equipment costs • $7 - $10/hr user fee after subscription typical message cost $5/hr	• messages can be received even if there is no one physically there to receive • cost effective and time effective	• user anxiety • need a network of people able to receive

TABLE 3 (continued)

Name and Description	Training Applications	Components	Production Costs	User Costs	Advantages	Disadvantages
			COMPUTER (Continued)			
COMPUTER NETWORKING Obtaining access to various databases and bulletin board services through telephone linkages with commercial information systems.	• course lectures and student responses can be linked • information sharing around a theme—for example Specialnet, a network sharing special education content	• modem • network service provider • microcomputer	• subscription fee and connect time fees vary widely	• subscriber fee and equipment costs • $7 - $10/hr user fee • terminal rental $125/mo	• cost effective/time efficient • access to large of information and numbers of people	• user anxiety • need network of receivers
COMPUTER-BASED INSTRUCTION Microcomputers or terminals from larger computers used to instruction.	• individualized instruction • classroom/instructional management systems	• microcomputer or computer terminal • appropriate software	• cost of providing instructional materials varies widely, $5,000 -$20,000/ program	• leasing or purchase fee for software • costs $40 - $1,000/ program • software may be provided by educators for those having own hardware	• learner has control • ease of use • expense decreasing • less time required for learner to achieve competency	• user anxiety • amount and types of software limited • software must be language-compatible with hardware

Descriptions of Selected Technologies

Perhaps the best way to explain how the telecommunication and electronic technologies function is through illustrations. Most of the technologies included in table 3 are comprised of a sending and receiving format. The five commonly used formats for sending information to provide distance training are shown in figure 2. These formats are mail services, telephone lines, cable or optic fibers, microwave, and satellite transmission.

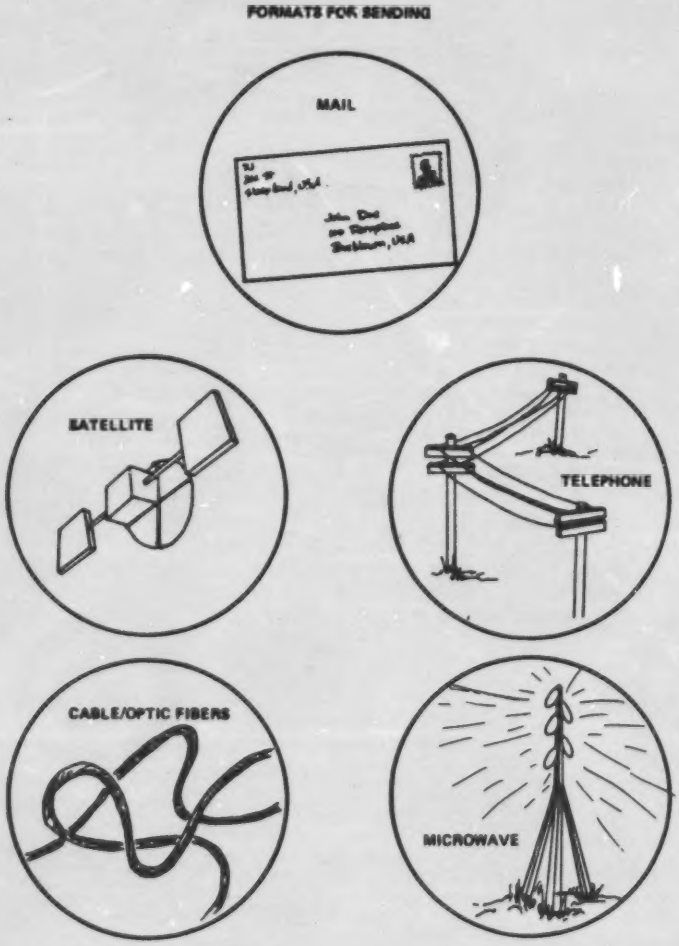

Figure 2. Formats for sending information

These formats are frequently used in combinations. For example, a video-teleconference can be transmitted by microwave or a cable to an uplink satellite dish, which then transmits the teleconference to receiving or downlink dishes.

There are at least eight formats for receiving information, which are shown in figure 3. These formats include telephone, radio, television, computer, print materials, slides/transparencies/films, fascimile, and audio- or videotapes/cassettes/-and discs. The formats for receiving can also be used in

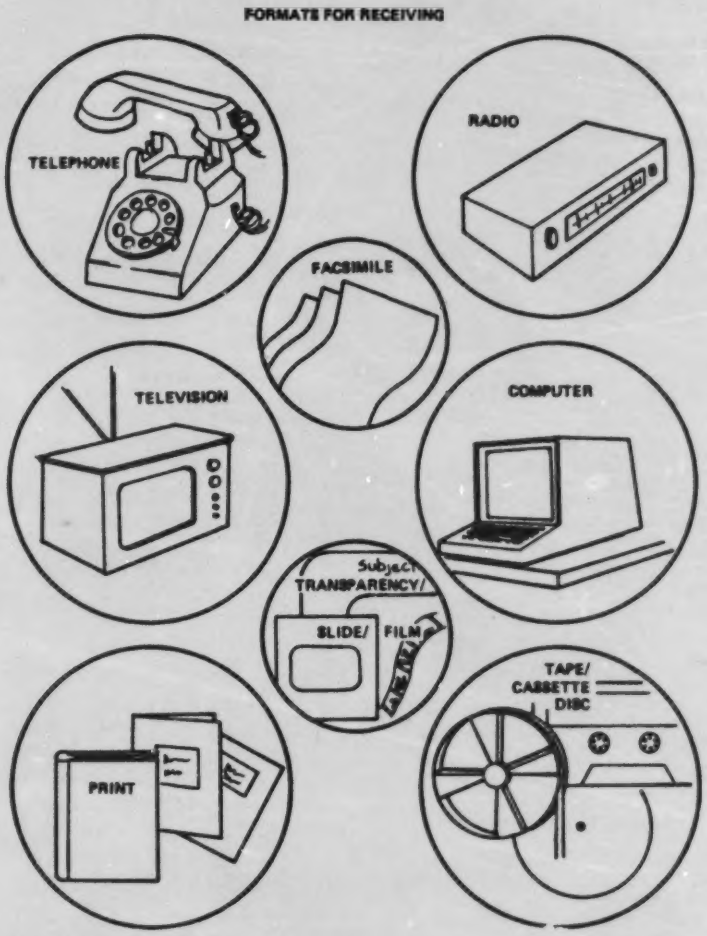

Figure 3. Formats for receiving information

combinations to provide training. For example, a videodisc can be used along with a computer-generated program in an interactive video program displayed on a television monitor.

There are almost unlimited combinations for sending and receiving formats. Four combinations are shown in figures 4 through 7. The first example, using the mail to send videotapes with printed supplements to trainees (figure 4), requires little explanation. Trainees use the videotapes at their own discretion, but have no opportunities for interaction with the trainer.

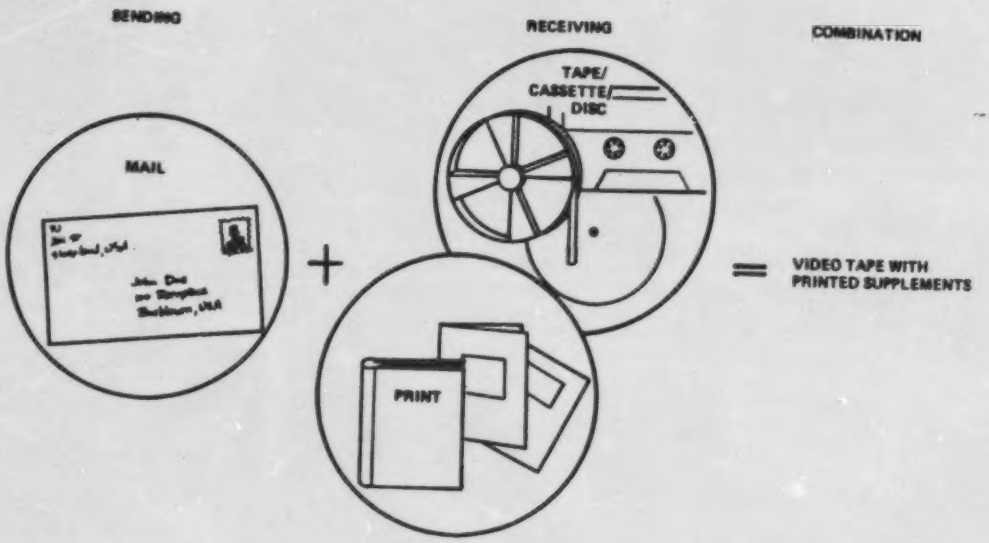

Figure 4. Videotape with printed supplements

The next example (figure 5) illustrates using the telephone lines to transmit information between or among computers at various locations in the country. When used for computer conferences, the participants interact in "real time" to send and receive messages instantly.

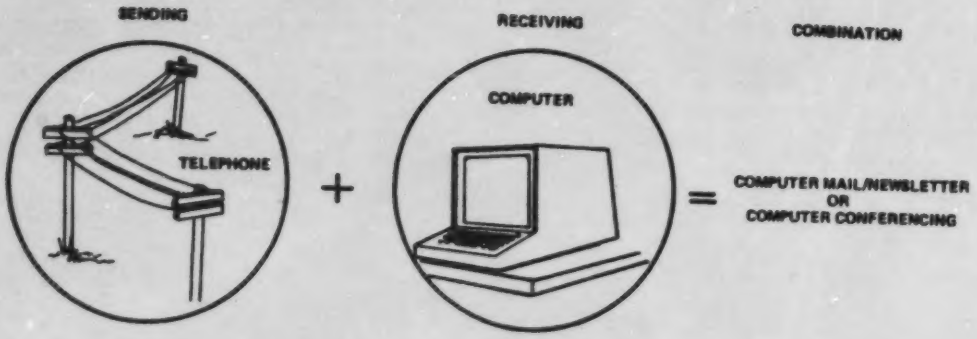

Figure 5. Computer mail, newsletter, or conference use

Telephone conferencing is depicted in figure 6.

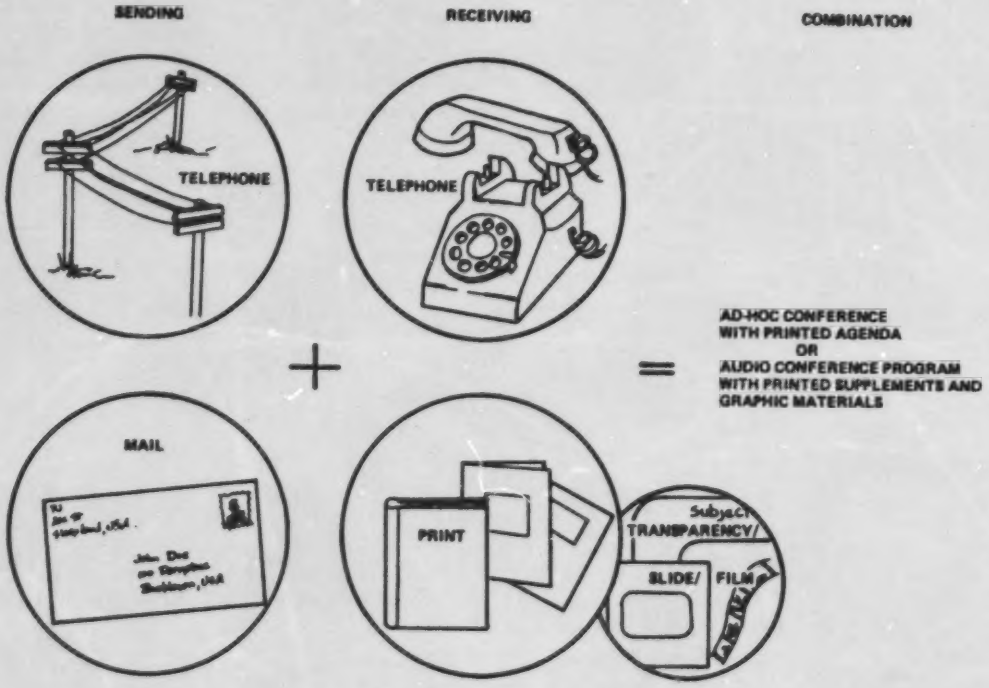

Figure 6. Telephone Conferencing

As shown, telephone lines transmit two-way audio training sessions. The participants use hand-held telephones, speaker-phones or loudspeakers. Printed materials, slides, and other graphics are sent to participants by mail prior to the conference. A telephone conference is done during "real time" and provides participants with opportuities to use visual materials as well as to interact with the trainer.

The most complex combination illustrated is shown in figure 7.

Figure 7. Satellite-transmitted video-conference

Satellite-transmitted video-conferences with two-way audio can include several sending and receiving formats. Cable, optic fibers, or microwaves can be used to link the signal carrying the live conference (and any videotapes, slides, etc. used) to an uplink satellite dish. The dish transmits the signal 22,200 miles to a satellite orbiting above the equator. The satellite antennae receive the signal and feed it to the transponders, which are amplifiers that change the frequency and intensity of the signal. The transponders feed the changed signal to other antennae that broadcast it down to earth to a downlink or receiving dish. Here again, cable, optic fibers, or microwaves are used to link the signal from the dish to the television monitors or wide-screen projection systems. The participants receiving the teleconference can, through telephone calls, interact with the teleconference personnel. Their voices can be heard by all persons watching the teleconference. Prior to the conference, participants can also receive printed information by mail such as agendas, key points, and evaluation sheets.

CHAPTER III

NATIONAL CENTER/NATIONAL ACADEMY CAPACITY

Current National Center Uses of Electronic Technologies

The National Center has embraced several electronic technologies in order to expedite communication and fulfill its multidimensional mission. Some of the electronic technologies are new, while others are well integrated in the organization and no longer are considered unusual. The latter include the telex system, word processors, microcomputers, and computer access to library holdings, while the newer technologies are message switching and electronic newsletters. A brief description of each of these technologies follows to explain current National Center capacity.

Telex System

The Western Union Telex II, which has been in operation since November 1981, is housed on the third floor of the 1960 building. According to its chief operator, Kathy Haycook, the Telex is used primarily for international messages. Three to four times more calls are received than are placed. Calls received average about five a week. The chief advantage of the system is that international time zones do not constrain quick, one-way communication.

Word Processors

Word processors have quickly been adapted for producing numerous documents and other hard-copy materials. Ernie Spaeth, director of Media Services, reports that the nine, in-place ATV

Jacquard 425 word processors are being supplemented with three more because the demand for them has been very high. In the Information Systems Division, Carl Oldsen has kept statistics on word processor use since its inception in 1979. While in 1979-80 the word processor was used 1,685 hours (87 percent of the available work time), in 1981-82 the use escalated to 2,087 hours--a 105 percent rate. During the past year, a word processor has also been used to ship weekly ERIC abstracts to Bethesda, Maryland, via telephone lines to the ERIC production headquarters' word processor. Not only is this a much faster way to ship, it is also more cost-efficient.

Microcomputers

There are several microcomputers in use throughout the National Center. Some of the microcomputers are being used to develop computer-based instruction programs (e.g., Jim Long's career guidance program) while others are used for analysis of project data (e.g. John Bishop's Research Divison projects). Microcomputers are also used by management (Steve Gyuro, Kay Adams, and Pam Davenport) for administrative record keeping, National Center evaluation, and budgeting purposes.

OSU Mainframe Computer

Another use of electronic technology commonly accepted is linkage with the vast mainframe computer system at The Ohio State University. The central computer facility and five branch terminals contain an IBM 370/164, two 380/205, a 7094 and 1130, two 2780s, and a 1620. System 2000 generalized database

management systems software has been installed and is being used by the National Center. This computer software provides an advanced interactive and report-generating capability since it supports sixty-four different databases simultaneously. National Center statistical analyses are conducted on several terminals that are linked to the OSU mainframe system. The Research Library at the National Center, also linked to the OSU mainframe system, is used to identify OSU library holdings.

Electronic Mail

More recently, two not-so-common electronic technologies have been adopted at the National Center. One is computer-based message switching (CBMS), which was started at the National Center in the fall of 1981. According to Carl Oldsen, the vendor of the system is the Bibliographical Retrieval Service in Latham, New York, where the mainframe computer is housed. Messages, which are limited to twelve lines or one hundred words, are typed into a terminal located in the Information Systems Division. Telephone lines carry the message to the mainframe in Latham for storage. When the fifty CMBS member organizations (RCUs, CCCs, state departments of vocational education, national organizations, etc.) use their terminals to call the mainframe, any message stored for them will immediately be transported by telephone lines and appear on their terminal screen or printout. The average use is about five hundred minutes a month or one hundred five-minute messages. CBMS is growing at the rate of two to three new members per month.

Electronic Newsletter

The same technology that is used for CBMS is used for another innovative communication mode, the electronic newsletter. Carl Oldsen described three newsletters begun in 1983: (1) the VOCN has the same membership as the CBMS and focuses on general-interest news items; (2) the High Technology for Postsecondary Educators is aimed at postsecondary educators and focuses on high technology issues; and (3) the NEW VENTURE NEWSWIRE deals with entrepreneurship as a vocational education concern. These electronic newsletters are too new to have statistics about their use. They appear to be useful because the length of items is not limited, making it possible to describe upcoming activities, summaries of research, and current concerns in greater detail than is possible with CBMS.

Telephone Conference

A recent electronic-technology-related activity at the National Center was its participation in a telephone conference call sponsored by Cornex International. The National Center has initiated or participated in other conference calls previously. The Connex-sponsored call, however, demonstrated how a vendor can facilitate and improve the quality of telephone conferences. Carl Oldsen and Yvonne Bergland represented the National Center in the conference call to eleven other sites. Connex provided the agenda by mail and facilitated the hour-long conference. The price for such calls is a $20 fee to Connex per location and approximately $30 per location for telephone charges for each hour of the conference. Consequently, an hour teleconference

among twelve sites costs approximately $600.

The Ohio State University Facilities and Services Available to the National Center

Several electronic technology-related facilities and services are in place on The Ohio State University campus. Of greatest interest are those that the National Academy could use for its activities. The OSU departments most likely to be helpful are (1) the WOSU Stations' Instructional Service; (2) Health Services Audiovisual/TV Center; (3) Center for Continuing Medical Education; (4) Office of Learning Resources; and (5) the Department of Photography and Cinema.

WOSU Stations' Instructional Service

WOSU AM-FM (radio-TV) are public broadcasting stations (National Public Radio and Public Broadcasting Service affiliates) and noncommercial services of OSU. The Instructional Services Department coordinates the use of these stations and other telecommunications technologies for education and training. It provides nonbroadcast video production, audiotape production, cable TV distribution, and interactive video-conference by microwave, cable or satellite telecasting.

Bruce Matthews, director of Instructional Services, believes that the best working arrangement with the National Academy is that of an agent or consultant for audio-video productions. For example, he feels that in the role of agent or network consultant, WOSU Instructional Services could organize a

cost-efficient national satellite-transmitted video-teleconference for the National Academy. By serving as the National Academy's agent (as opposed to serving as a potential vendor), the best technical specifications, production facilities, uplinking and downlinking services, satellite time, and national networking services would be procured through the OSU bidding process.

Although the costs of most WOSU services are difficult to estimate without specifics, Bruce Matthews provided the following examples. Currently a weekly one-hour show is broadcast for Pharmacy Continuing Education over FM radio at a cost of $200 per show. All production, transmission, and air-time costs are covered in that price The audience of pharmacists is primarily located in Ohio, with a few in West Virginia and Kentucky.

A second example is a training videotape that was recently completed for the Department of Administrative Science. The charge for production of the ten-hour accounting course was $10,000 or about $1,000 per hour of finished videotape. The videotape included lectures, visual aids, and close-ups of a student writing in a ledger, but did not have computer graphics or location shots. The videotape will be used over closed-circuit television for an OSU Accounting 450 course.

A third example is the satellite-telecast video-teleconference coordinated for the College of Education early in 1983. The video-conference, "Microcomputers in Education," included two-way audio and was received by forty-six sites in the United States and Canada. The four-hour conference cost

approximately $70,000. According to its organizer in the College of Education, Jack Culbertson, the feedback from the participants was "euphoric" and "highly positive." The only negative comments were focused on the physical space at the receiving sites where, in some cases, there were no tables or other accommodations for taking notes.

Health Services Audiovisual/TV Center

The Health Services Audiovisual/TV Center is the production arm of the Ohio Regional Medical Audiovisual Consortium. Directed by Robert S. Potts, the AV/TV Center is located in the Allied Medical Building at 1583 Perry Street. The AV/TV Center's offices are in Room 243 and its production facilities are located on the first floor. While the AV/TV Center's primary concern is to provide audiovisual materials for the College of Medicine, it also sells services to other OSU colleges and to business and industry on a not-for-profit basis.

Dr. Potts explained that the varied services of the AV/TV Center are similar to WOSU's, although on a somewhat smaller scale. The AV/TV production entails standard broadcast-quality equipment. The AV/TV Center's capabilities include slide-tape production; videotape duplication and editing; videotaping; audio recording, editing and duplication; audio-conferences; receiving video-teleconferences by satellite; and design and production of television programs for closed circuit (ITV and patient education), open air (through WOSU or Ohio Education Broadcast Network), and cable (through Warner Amex).

The Allied Medical Building can receive satellite-transmitted video-teleconferences through a satellite receiving dish (downlink) located on its roof. The dish is a 3.5-meter Macom mounted on a rotor, which means it can be turned to pick up signals from any one of the domestic satellites that transmit ad hoc. The AV/TV Center can therefore receive conferences transmitted by satellite, but it cannot transmit teleconferences because it does not have an uplink dish. Teleconferences can be received in several classrooms in the Allied Medical Building. Two rooms hold four hundred persons each, six rooms hold one hundred persons, while several small rooms hold thirty to forty persons. Each room is equipped with a proportionate number of television monitors that are linked to a central control room. The rooms can provide two-way audio for teleconferences through telephone hookups.

Center for Continuing Medical Education

The Center for Continuing Medical Education has provided noontime education through teleconferences for physicians since 1962, through its Ohio Medical Education Network (OMEN). The center is located in the College of Medicine's Starling Loving Hall, Room A-352 at 320 W. 10th Avenue. The coordinator of OMEN is Art Bartfay who also serves as the teleconference host. OMEN holds hour-long lunch hour seminars thirty weeks a year, September through April. Physicians in 158 hospitals or clinics located in twelve states and Canada listen to a loudspeaker that amplifies the telephone-transmitted seminar, watch related

slides, and follow along in their seminar outlines. After the approximately half-hour long lecture/discussion by two expert physicians (typically OSU medical faculty) the remaining time is spent on questions from the participants. Art Bartlay moderates the telephone calls placed by participants to the OMEN studio to ask the expert physicians questions related to the lecture. The questions and answers are heard by all the participants. In order to preserve the small seminar approach, the number of hospitals participating at one time is limited to no more than twenty. The same program is repeated several times per week to accommodate all the member hospitals. Physicians receive continuing education credits for participating in the OMEN programs.

Memberships, based upon the number of hospital beds, cost between $31 (0-99) to $39 (three hundred plus beds) per program. For example, a small hospital with fifty beds would pay $31 per program for a total annual membership fee of $930. The membership fee pays for the OMEN program, a weekly program package that contains posters, a set of twenty to twenty-five color slides, and program outlines for each physician. Audio-cassettes of each program are available for an additional $6.50. Member hospitals are responsible for investing in audio and slide equipment, as well as for the phone charges for two telephones. The audio equipment consists of an amplifier and loudspeaker. A 35mm projector for 2x2 slides is also required. Two telephones must be installed in the conference room receiving the OMEN program. Extension or plug-in phones can be used. The first

phone, a Western Electric 30-D POP complex phone, will be connected by a cord to the amplifier and loudspeaker. As illustrated in figure 8, this phone has a cut-off key to avoid feedback squeals.

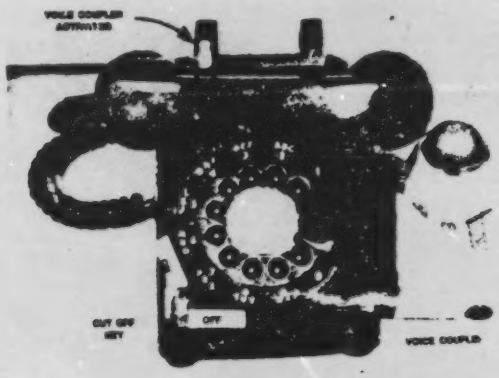

Figure 8. A "POP Voice Coupler" telephone

The second phone is a regular telephone used to dial Columbus directly from the conference room without going through a hospital switchboard.

According to Jon Hollett, director of the Center for Continuing Medical Education, the studio and OMEN teleconference system could be used by the National Academy to provide training. The costs entailed would include equipment for which training receivers would have to pay, the costs incurred to transmit the information, and telephone charges.

Office of Learning Resources

The Office of Learning Resources (ORL) offers a wide range of media-related services to OSU staff and students. The main office is located in Lord Hall at 124 West 17th Avenue. As a

noninstructional unit within the College of Education, OLR's primary goal is to facilitate the teaching-learning process. While many of the services, such as the Dial Access System, are not conducive to supporting National Academy training activities, other services are potentially useful. These include servicing audio, video, and computer equipment; renting audio and video equipment; selling audio and video supplies and repair parts; loaning audio and video materials; producing audio and video tapes, slides, slide-tape programs; and consulting in various stages of audio or video program and computer-based instruction production.

The ORL has a materials reference service that provides information and assistance concerning the availability and requisition of audiovisual materials from outside sources. The service maintains a collection of reference indexes and catalogs and will help locate materials for purchase or lease. ORL also provides assistance in selecting equipment or designing systems to meet audio or video needs.

The OLR is also responsible for developing and managing computer-based instruction for OSU. Assistance is provided in developing computer-based instruction (CBI) in the form of tutorials, practice, simulation, or evaluation computer programs. CBI has evolved at OSU since the late 1960s when computer terminals were first installed for OSU staff use. Since 1978 CBI has been operated through the Phoenix System developed by Goal Systems International, Inc., Columbus, Ohio. OSU serves as the test site for new Phoenix capabilities, one of which is the EASE

authoring system. EASE allows inexperienced instructors to design and develop programs which include multiple choice tests, drill and practice sections, and true-false questions. Currently over 20 major CBI biological sciences, veterinary medicine, architecture, music and other programs are offered each quarter and used by about 3,000 students.

Department of Photography and Cinema

The Department of Photography and Cinema provides several services that could be useful for National Academy training activities. The department is located in 206 Haskett Hall at 156 West 19th Avenue. The department uses students for some of the service and acting, but relies mostly upon full-time professionals. The cinema component makes 16mm films and filmstrips. Film production is "full service," starting with writing the script through creating the final edited master copy.

Constraints Regarding Use of Technologies

It is evident from the information presented in the previous chapters that there are many technologies available and that many have been used for training in other organizations. It is also clear that a number of technologies are in use at The Ohio State University and at the National Center. However, several constraints have inhibited, and could inhibit, the future use of technologies for training purposes. These constraints must be considered to assess realistically the feasibility of using various technologies to enhance the training function. The constraints fall into the following four general categories:

- o National Center contract restrictions related to producing and disseminating audio and video materials
- o Lack of funds to invest in costly equipment (National Center and clients)
- o Reluctance to change proven ways to provide and receive training
- o Need to maintain personal contact, to disseminate information informally and to take advantage of "serendipitous" opportunities to provide service to the field

National Center Contract Restrictions

The National Academy is one of the many projects contracted with the U.S. Department of Education to be conducted as a function of the National Center. The National Center contract specifies acceptable ways in which information may be collected and disseminated. The contract also specifies the media that may or may not be used to disseminate National Center information and products. The restrictions in the contract, as explicated in the "Letter for Option," prohibit the development and dissemination of audiovisual media with the single exception of overhead transparency masters. The restrictions are not entirely clear because they do not name all of the telecommunication and other technologies that could be used potentially. The all-encompassing intent of the restrictions has become evident, however, in a recent attempt to provide a workshop/conference on a topic that was pertinent to vocational educators across the nation at that point in time. In this recent request (August 1983) for approval and additional funds to conduct a national, satellite-transmitted video-teleconference, the National Center

was informed by the sponsor that such an event would have to receive Publications and Audio Visual Advisory Council (PAVAC) clearance in order to be approved.

PAVAC clearance entails detailed justification and explanation of an intended event; this requires much National Center staff time. It also takes several months of time for sponsor approval. Obviously, many topical activities that would be most suited to dissimination through one or a combination of the technologies would require fast turnaround from inception to execution. Fast turnaround on a topic of national importance may mean as little as a few days to three months, depending on the urgency of the training or information being presented. PAVAC clearance restrictions render such timely response to the needs of the vocational education constituency impossible. The importance of having the capability to respond quickly to meet training and updating needs of a larger audience cannot be over-emphasized. This constraint prevents the National Academy from providing the very type of training/updating service that would enhance the quality of vocational programs throughout the nation.

Moreover, it appears that the sponsor recognizes this need for timely responsiveness to a larger audience, since, in that same "Letter for Option," it clearly states that the National Academy should investigate the potential for using technology to provide training. The incongruity within the guidelines from the sponsor underscores the importance of technologies in training functions. There is evidently an urgent need to clarify the guidelines so that the National Academy has the freedom to

issue, however. Up-front monies, at times considerable sums, (e.g., $20-25,000 for a teleconference) would have to be readily available in order to purchase vendor services on an as-needed basis. It appears reasonable that, in order to develop videotapes, conduct audio and/or video-teleconferences, and use other electronic technologies effectively, the National Academy must have a separate budget allocated to such potentially non-cost-recovery endeavors. Such a budget would enable the National Academy to take calculated risks without endangering its ongoing function of providing traditional workshops, study tours, and conference activities.

Reluctance to Change

The reluctance to change stems from an attitude popularly known as "if it's not broken, don't fix it." Certainly the current training offered by the National Academy is not "broken." Indeed, feedback from clients has consistently shown that the training activities serve the participants well. The reluctance to change, however, can impede the ever-growing need to provide training to a broader vocational education constituency. Rapid changes in what issues vocational education must address require frequent updates. For example, a decade ago economic development was rarely, if ever, a major concern of any vocational education administrator. Today it is a priority that rivals other recent concerns such as effectiveness and excellence, technological change in the workplace, and retraining.

Consequently, maintaining the status quo could inhibit the National Academy in providing national-level training. While other organizations have experimented with using technologies for training, no specific ones are firmly entrenched at this time. However, it is clear that if the National Center remains cognizant of the vast opportunities to expand their training services through technologies, other organizations will attempt to use them as well.

Need to Maintain Personal Contact

The need to maintain personal contact cannot be overlooked as a constraint on using electronic technologies for training. On-site participation in conferences and face-to-face training activities are inherently rewarding because the interaction promotes congeniality, loyalty, a sense of being part of a cause, informal sharing of ideas, opportunities to meet and rate experts who might be helpful in the future, opportunities to impress potential clients, opportunities to provide instant technical asssistance, and so forth. There is clearly no substitute for these types of serendipitous opportunities. Also, the notions are prevalent that travel to conferences and workshops is a reward, a welcome change from routine activities, or a motivator for staff.

Nonetheless, it is also well understood that only a very small percentage of any staff has the opportunity for as much travel as desired. The lack of funds for travel is partially the reason, but absence from the ongoing work that still must be done

develop innovative strategies to use technologies for training. It is critical that the National Academy not miss opportunities for broader training/information dissemination to the national vocational education constituency because of sponsor restrictions.

Lack of Funds

Lack of funds is another major constraint. While the cost of providing National Academy training is recouped by charges paid by participants, National Academy administrative costs are underwritten by the National Center contract. The costs involved in producing and disseminating training through any of the electronic technologies would be considerable initially, and not all of the associated costs could be recovered on an immediate or even long-range basis. For example, a three-hour, two-way audio, one-way video-teleconference received by twenty sites, each with one hundred to three hundred participants, would cost approximately $60,000. If each site paid its own refreshments, wraparound conference costs and down-linking (receiving) expenses, the cost of production and telecasting would be estimated at $20,000-$25,000. This latter amount could be recovered by prorating costs to participating sites according to the number of participants, but actually collecting the money could be exceedingly problematic for National Academy staff. It might well be advantageous to have funds contracted specifically for such events that are unlikely to recover their costs.

Whether or not funds could be recovered is not the entire

is also a strong deterrent. It cannot be denied that travel is time consuming, even when participants can travel during off-work hours. To attend a two-day conference out of state, for example, a participant typically must have at least half a work day, often an entire day, for travel time. With the rising costs of airfare, per diem, and lodgings, a typical two-day conference in a city halfway across the county costs about $1,000. As a result, only a small proportion of any staff's members have the opportunity for staff development through training activities that require travel.

The use of electronic technologies provides a viable alternative to no training at all. Thus, if the nature of the training session is such that it can use one of the electronic technlogies, then the trade-off of personal contact and its associated benefits can be outweighed by the increase in the number of participants in the training.

CHAPTER IV

FEASIBILITY ANALYSIS AND RECOMMENDATIONS

Client Preferences for Training

Presently the National Academy uses little electronic technology for training purposes. Therefore National Academy training requires time-consuming and expensive travel on the part of organizers, presenters, and clients. Furthermore, training is limited to those who can participate at one specific time and location unless the training is repeated, which compounds the cost.

There is no doubt, however, that face-to-face communication and on-site training is preferred by National Academy clients when possible. Two recent external surveys confirmed not only that clients prefer face-to-face training if possible, but also that when travel is not possible, they prefer visually- oriented training and/or interactive training modes. A survey question asked at a recent activity of the Ohio State Department of Education is shown in figure 9.

Considering your current professional responsibilities/ opportunities/restrictions, RANK each of the following in order of your preferences. Rank 1 is the most preferred, 2 is second, 3 is next, 4 is next, 5 is next, and 6 is the least preferred.

( ) Participate in a telephone conference.
( ) View/listen to a videotape of a teleconference.
( ) Attend a conference in person out of state.
( ) Read a document of the proceedings of a conference.
( ) Attend a video-teleconference in person within the state.
( ) Listen to audiotapes of conference speakers.

Figure 9. Question used to survey preferred conference modes

The results from sixty-six respondents (e.g., state department of education administrators, education diffusion experts, university faculty, local vocational supervisors and educators) are shown in table 4.

TABLE 4

CLIENT PREFERENCES FOR MODES TO ACCESS CONFERENCE

Preferences of Respondents	Participate in Telephone Conference	View Videotape of Conference	Attend Conference Out-of-State	Read Proceedings of Conference	Attend Teleconference In State	Hear Audio Tapes of Conference
First	7	2	34	3	19	1
Second	9	15	8	7	28	0
Third	17	27	5	3	11	3
Fourth	16	18	8	5	4	15
Fifth	12	4	6	12	4	29
Sixth	5	0	5	36	0	18
Total Respondents	66	66	66	66	66	66

As shown in table 4, the respondents' preferences were as follows:

1. Attend conference out of state
2. Attend teleconference in state
3. View videotape
4. Participate in telephone conference
5. Hear audio tape
6. Read proceedings

The rationale behind adopting technologies for training delivery and the constraints on their adoption have been discussed in previous chapters. The specific purposes for adopting technologies to supplement the traditional modes of training delivery are as follows:

- o To provide high-quality, stimulating, state-of-the-art training
- o To serve clients nationally, as opposed to regionally or locally
- o To serve more clients than is now possible with traditional modes of training/communication
- o To provide more frequent training opportunities for clients
- o To provide training at a lower cost to the National Center and its sponsors
- o To provide training at a lower cost to clients
- o To reach clients in remote, often inaccessible, locations
- o To develop and maintain communication with a broader client base (e.g., JTPA administrators)
- o To reach clients more rapidly, even immediately

- o To save clients the time of travelling to training sites
- o To save National Academy staff the time of travelling to training sites
- o To reserve National Academy staff time for production and dissemination of training materials

These purposes are based upon the parameters of saving money and time while increasing the number and types of clients served with high-quality training. Thus the ideal technologies could provide quality training to many clients in many locations at a low cost to the National Center and the clients. In addition, these technologies would reduce the need for travel and thereby reduce the amount of time required to participate in or to provide the training. They would also be relatively easy to produce and disseminate. And finally, the ideal technologies could be used in the cost-recovery, not-for-profit National Academy which has the mission to provide leadership training on a national (as opposed to a local or regional) level.

Feasibility Analysis of Technologies

In order to determine the feasibilty of the technologies for training delivery, the technologies were rated in terms of meeting National Academy purposes for leadership development.

The technologies were rated for their potential to meet National Academy purposes with the following scale:

4 = Yes, technology definitely can meet purpose

3 = Good possibility that technology can meet purpose

2 = Perhaps, but is doubtful that technology can meet purpose

1= Doubtful, that technology can meet purpose

o - No, technology cannot meet purpose

Table 5 shows the ratings of the technologies useful for training.

TABLE 5

RATING OF TECHNOLOGIES FOR MEETING NATIONAL ACADEMY TRAINING DELIVERY PURPOSES

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product Dissemin. Time	RANKING
AUDIOTAPE													
• Noninteractive													
• Audio recording of a conference, lecture, instructions, workshop, symposium, etc.	1	4	2	2	3	4	2	1	4	4	4	2	33
• Individual or group use (Sent anywhere by mail)													
TELEPHONE													
• Interactive													
• Ad hoc telephone conference and telephone lecture/question-answer session	3	4	4	3	2	3	4	2	4	4	4	3	40
• Group use (national, regional, local)													
RADIO (AM and FM)													
• Noninteractive													
• Lectures or discussions by experts and announcements of training events	1	1	1	2	2	4	3	3	1	4	4	1	27
• Individual or group use (regional, local)													

[1] Key: 4 = YES
3 = GOOD POSSIBILITY
2 = PERHAPS
1 = DOUBTFUL
0 = NO

TABLE 5--continued

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product. Dissemin. Time	RANKING
RADIO (SCA)													
• Noninteractive													
• Lectures or discussions by experts and announcements of training events	1	1	1	2	0	2	2	1	1	4	4	1	20
• Individual or group use (regional, local)													
VIDEOTEXT													
• Interactive (limited)													
• Announcements of training events and capsule summaries of training information	0	1	0	0	1	2	4	1	2	4	4	2	21
• Individual or small group use (regional, local)													
FREEZE-FRAME													
• Noninteractive													
• Graphics to accompany other training modes	0	1	0	0	1	2	4	1	2	4	4	2	21
• Individual or small group use (regional, local)													
ELECTRONIC BLACKBOARD													
• Noninteractive													
• Graphics to accompany other training modes	1	3	1	1	2	2	4	1	2	4	[illegible]	4	29
• Group use (national, regional, local)													

TABLE 5--continued

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product. Dissemin. Time	RANKING
VIDEOTAPE • Noninteractive • Video and audio recording of conference, lecture, instructional information, demonstrations, etc. • Individual or group use (Sent anywhere by mail)	3	4	3	2	3	4	3	3	3	4	4	4	40
VIDEODISC • Interactive or noninteractive • Video and audio single-frame and motion picture recording of instructional information and demonstrations, etc. • Individual or group use (Sent anywhere by mail)	3	4	1	1	0	1	3	1	3	4	4	4	29
TELEVISION (LOW POWER) • Noninteractive • View instructional information • Individual or small group use (regional, local)	2	0	0	0	0	4	2	1	1	4	4	1	19
TELEVISION (OPEN BROADCAST) • Noninteractive • View instructional information and demonstrations • Individual or small group use (regional, local)	4	0	0	0	0	4	2	1	1	4	4	1	21

TABLE 5--continued

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product. Dissemin. Time	RANKING
TELEVISION (CABLE) • Noninteractive and limited interactive • View instructional information and demonstrations • Individual or small group use (local)	4	0	1	1	0	3	3	0	0	4	4	1	21
TELEVISION (SATELLITE) • Interactive and noninteractive • View conferences, lectures, instructional information, demonstrations, etc. Opportunity for questions and answers. • Large group use (national, regional)	4	4	4	1	0	3	4	2	4	4	4	1	39
COMPUTER-BASED MAIL/NEWSLETTER • Noninteractive and limited interactive • Announcements and descriptions of training events • Group use (national, regional, local)	0	2	1	3	3	2	4	1	2	4	4	4	30
COMPUTER NETWORKING • Interactive • Discuss instructional information and limited demonstration • Individual use (national, regional, local)	1	2	1	2	3	2	4	1	2	4	4	3	29

TABLE 5--continued

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product. Dissemin. Time	RANKIN
COMPUTER-BASED INSTRUCTION													
• Interactive • Software to instructional materials and respond to questions, tests and review • Individual (Sent anywhere by mail)	2	3	2	2	2	2	2	3	1	4	4	0	27

TABLE 5--continued

Name and Training Application(s)	Meets National Academy Purposes[1]												
	Quality Stimulating Training	Serve Nationally	More Clients	More Frequent Training	Low N.C. Cost to Produce	Low Client Cost to Use	Reach Clients Rapidly	Broader Client Network	Reach Remote Areas	Save N.C. Travel Time	Save Client Travel Time	Save Product. Dissemin. Time	RANK[1]
COMPUTER-BASED INSTRUCTION													
• Interactive													
• Software to instructional materials and respond to questions, tests and review	2	3	2	2	2	2	2	3	1	4	4	0	27
• Individual (Sent anywhere by mail)													

As seen by the rating scores in the last column in table 5, none of the technologies rate the highest possible score of forty-eight. Some of the technologies meet the National Academy purposes more than others, however. Based on the ratings presented in table 5, the recommendations for adopting technologies for National Academy training delivery are as shown in table 6:

TABLE 6

RECOMMENDED TECHNOLOGIES

Rating	Technology Training Application	Recommendation
40	Regularly scheduled telephone program with two-way audio	Currently feasible and highly recommended. Facilities and equipment for production of lecture series available. Cost approximately $16,000 for eight one-hour program series reaching forty-eight sites nationally.
40	Ad hoc telephone conference calls among several sites	Currently feasible and highly recommended. National Center has speakerphones. Can be done with or without vendor. With vendor, cost approximately $50 per hour per site.
40	Videotapes of speakers or selected portions of conferences and workshops. (Can be followed up with ad hoc telephone conference calls)	Currently feasible and highly recommended. Cost is approximately $1,000 per one and one-half hour to one and three-quarters hour finished tape. Tapes can be duplicated for $25 (1/2" tape) or $65 (3/4" tape) for that length tape. Can be leased or sold by subscription.

Rating	Technology Training Application	Recommendation
39	Satellite-transmitted video-conference (television or large screen) with two-way audio	Currently feasible and recommended for highly visible, current topic with national interest through WOSU and other vendors. Cost to produce and transmit approximately $25,000 for hour program reaching twenty to 50 sites nationally. Receiving costs ($400-$1,500 paid by sites
33	Audiotapes of speakers or selected portions of conferences and workshops	Currently feasible but only recommended for use in a multimedia training package due to user preferences. Cost of producing tapes nominal if done in-house (60 minutes = $1.10, 90 minutes = $1.50, 120 min. = $2.20).
30	Computer mail/newsletter to announce and report training events	Currently feasible but only recommended for communication about training. One drawback is limitation to sites that must have computers with modems. Average cost per message is $2.00 while newsletter article varies from $.50 to $5.00.
29	Computer conferences	Currently feasible but only recommended for users with computers with modems. Topics best suited to those that require graphic portrayal. Not feasible for large groups at each site or for users with "technophobia."

Rating	Technology Training Applications	Recommendation
27	Electronic Blackboard	Currently feasible but not recommended alone due to its specialized use for graphics presentation. Could be considered in tandem with telephone conferenes.
29	Videodisc (Also, Interactive Videodisc System)	Not feasible due to high cost of production of master videodisc ($2,300 for conversion from videotape--$250,000 for custom disc). Once made, videodiscs cannot be updated--new ones must be made. Also, videodisc is best suited for demonstrations and use as interactive training would be expensive for producers and users.
27	Computer-Based Instruction.	Not currently feasible because only limited software has been developed for training. Has great future potential, however, since educational organizations continue to acquire computers and develop appropriate software.
21	Radio (AM and FM)	Not feasible for National Academy training. Access to convenient broadcast times doubtful and audience not necessarily composed of target users.

Rating	Technology Training Applications	Recommendation
21	Radio (SCA)	Not feasible due to high cost ($40,000 year SCA lease) for potentially small audience.
21	Open-Broadcast Television and Cable Television	Not recommended because not nationwide, cannot be targeted to specific audiences, and programming often at inconvenient times.
21	Videotext and Freeze-Frame	Not recommended because very limited potential training uses and number of potential users.
19	Low-Power Television	Not recommended because very limited number of potential users.

In summary, the technologies most recommended for adoption in the near future are--

- o a telephone lecture series,
- o telephone ad hoc conferences,
- o videotapes, and
- o ad hoc satellite-transmitted videoconferences with two-way audio.

These four modes of training are further discussed along with suggestions for National Academy training activities.

Telephone Lecture Series

A telephone lecture or seminar program series could be developed similar to OSU's OMEN program. Since electronic technology is in place, the National Academy would not

need to invest in equipment to transmit the series. The National Academy could sell subscriptions to vocational educators nationally for the eight-part series. The National Academy would organize taping the eight half-hour presentations. Accompanying slides or transparencies and printed materials would be produced and sent to subscribing sites. When the program is aired, the speaker or other discussants would be present in the telephone studio to answer questions from the participants at the subscriber sites.

The total cost of the eight-part series presented three times to a maximum of sixteen to eighteen sites each time is estimated at $16,500. That cost includes equipment charges, telephone long distance charges, and the cost of producing and mailing the visual materials to participating sites. If there were approximately forty-eight sites (3 x 16), each with an average of twenty-five persons enrolled, then the series could reach at least 1,440 individuals. The average cost to the National Academy per individual would be approximately $11.50 for the series or $1.50 per program.

Participating sites would pay subscriber fees to reimburse the National Academy's cost. Using the example above, a site with twenty-five persons would pay less than $300 for eight programs and the accompanying materials. The sites would also pay approximately $300 to purchase equipment (one time charge) and long-distance telephone charges (estimated at $24 per series). Additionally, sites could opt to purchase audio tapes of the series at the cost of $7.00 per program.

Ad Hoc Telephone Conferences

Ad hoc telephone conferences should be planned and conducted through a vendor to ensure clarity in the connections. Four to ten participants could comfortably confer for an hour to three hours with the use of speakerphones. Individuals could take breaks when they needed them without interfering with the others. Agendas, written materials, and graphics would be sent by mail for participants' review prior to the teleconference. The teleconference proceedings could be recorded for transcription purposes if desired.

The cost for a one-hour conference with ten participating sites located anywhere in the continental United States would be approximately $500 if arranged and networked by a vendor (e.g., Connex International). The National Academy could recoup the cost per site by billing each site for its share ($50 per hour) afterward. Another arrangement for financing conference calls would be to agree to conduct a specified number of conference calls as part of the National Center contract.

The topics for ad hoc telephone conferences would typically be timely; where participants need the information quickly and require interaction to clarify points. The topics could also be precursors or follow-ups to traditional training sessions or conferences. The calls could be made in a series that would constitute a course of training. As in traditional training sessions, certificates of completion and evaluation sheets could be mailed to participants.

Videotapes

Many current National Academy and National Center training activities are conducive to videotaping. For example, portions of the Developing a Curriculum (DACUM) workshops could be videotaped and edited to provide a DACUM training tape. Guest speakers who provide professional development inservice training to National Center staff could also be videotaped and the resulting tapes edited to provide videotaped discussions for constituents. There are many other potential uses for such videotapes.

To produce, edit, and duplicate tapes for a finished one and-three-quarter-hour master tape of a speech and subsequent question-answer session would cost between $1,000 and $1,500. This would include several hours of editing and appropriate character generation. For an additional $300-$500, Events Video would also develop an introduction with credits that could be used with all videotapes.

The National Academy should plan to develop a number of individual tapes or series of videotapes. Accompanying documents could be produced in cost-recovery formats. The videotapes should be marketed to the appropriate audiences through the same channels used to market other cost-recovery materials. The videotapes could be leased, but it would be less troublesome to sell them outright. At a cost of about $100 to $125 per videotape, the buyers would find the cost per person very low, especially if they used the tapes over a period of time. A

series of videotapes would be sold through subscriptions, much like the Facts and Findings series is now sold.

Aside from selling the videotapes, the National Academy could use portions of videotapes or entire videotapes in traditional training sessions and national conferences. Videotapes could also be used by individuals who travel to the National Center for inservice and updating purposes through the Inresidence Program. Once a number of tapes are developed, portions of various tapes could be edited and combined as new videotapes to explain trends and provide overviews. And a final suggestion, although there are many more possibilities, is that videotapes be used to explain key ideas in satellite-transmitted video teleconferences or used in tandem with telephone conferences.

Satellite Video-teleconferences

Video-teleconferences are considered the next best mode to actually being there. They could be telecast to most parts of the United States with domestic commercial satellites and could be linked to many countries through linkges to international satellites.

Satelllite-transmitted video-teleconfereces could be either scheduled annually, semi-annually, quarterly or be arranged ad hoc. Ad hoc teleconferences would be best suited to address current issues of national importance such as the Job Training Partnership Act and its ramifications or the impact of the national demand for for excellence in education on vocational education. Regularly scheduled conferences would address

priority topics such as the use of microcomputers for vocational education or the retraining of displaced workers. The teleconferences would be three to four-hours long in order to provide sufficient information and allow for question and answer sessions involving the participating sites.

Participating sites would receive advance information to advertise the teleconference to their constituents. Each site would also receive supplementary written and graphic materials for wraparound sessions led by a local conference coordinator. As in traditional training sessions, evaluation sheets and certificates of completion would be issued when appropriate.

The cost to produce the visual materials would vary with the topics. In most cases videotapes would be made to illustrate key concepts. The videotapes, which could also be used in other types of training activities, would cost somewhat less than $1,000 per finished hour. The cost to produce master copy sets of training materials and handouts (about 100 pages plus notebook) for the wraparound sessions would be approximately $23 per participating site. Each site would be responsible for duplicating the materials for individuals.

The total cost of each teleconference would vary greatly. In July 1983 several vendors provided estimates for a sample teleconference that would be produced and transmitted from the National Center facility. The estimates included all the costs of producing and transmitting a three-and one-half-hour broadcast-quality teleconference to twenty sites across the nation. Three of the vendors, WOSU at The Ohio State University,

Public Service Satellite Consortium, and Westacom, Inc., provided the lowest estimates. Each of their estimates was approximtely $57,000 but the costs for specific elements varied. The cost for producing and transmitting the teleconference ranged from $17,520 to $24,810. The range for receiving the teleconference at twenty sites was $25,300 to $40,700.

A breakdown of the various elements for a three-and-one-half hour teleconference was as follows:

o set design and construction in the National Center facility to suit topic	$500-$2,000
o broadcast-quality equipment including cameras, character generator, TV monitors, lights, etc. Remote truck units	$3,000-$5,000
o videotape to record teleconference four sixty-minute 3/4" cassettes	$120-$160
o staff and production crew director engineer, cameramen, technicians--eight-ten total	$5,000-$6,000
o telephone hookup (toll charges not included)	$650
o insurance advised but not mandatory	$500-$1,000
o uplink via cable or microwave and dish to satellite for four and one-half hours (extra hour needed to test system prior to telecast)	$6,000-$7,000
o satellite time for four and one-half hours	$1,700-$3,000
subtotal to produce and transmit:	$17,520-$24,810

o downlink to receive teleconference at twenty PBS stations or hotel sites, telephone connections, TV monitors or wide-screen projectors, room for up to one hundred and fifty people each site	$23,000-$37,000
o management fee at 10% per downlink cost	$2,300-$3,700
total estimates:	$42,820-$65,510

The estimated costs for receiving the teleconference at the twenty sites were high because the vendors would charge to seek out and rent appropriate facilities. Based on these estimates, it is recommended that the National Academy not contract with a vendor for most downlink site arrangements. The National Academy should send announcements of the teleconference to state directors of vocational education, postsecondary institutions, and other potential audiences. The cost to each site for receiving the teleconferenes would be less ($400-$1,500) if arranged locally. There is at least one PBS station with a satellite downlink dish in every state of the continental United States and many postsecondary institutions also have downlink dishes.

Although the cost for producing and transmitting a teleconference appears to be high, the per-participant cost is relatively low. If for example, twenty to thirty receiving sites have one hundred to one hundred and fifty participants each, then two thousand to forty-five thousand persons would participate. Consider the following example, which is realistic for a

vocational education teleconference: twenty to thirty sites with one hundred to one hundred and fifty participants at each site would equal two thousand to forty-five hundred participants. The per-participant cost would be $4.45 to $10.00 if the teleconference cost $20,000 to produce and transmit. Even if it cost $25,000, the per-participant cost would only be $5.55 to $12.50.

The National Academy could recoup the cost of the teleconference by charging each site for a share of the conference. The cost of the share could depend upon the number of participants or could be the same set fee for each site. The sites could in turn charge the participants a relatively low, nonprofit conference fee of $15.00 to $30.00, which would also include the costs for receiving the teleconference, handouts, coffee, and lunch.

Future Considerations

Although computer-based technologies are not feasible at the present time for National Academy training, they should be considered for adoption in the near future. As described in chapter 2, computer use has increased dramatically in public schools. Since many of the intended clients of the National Academy are located in public schools and will have increasing access to computers, it is sensible to begin development of software for training in the near future.

One major problem could impede software development, however. Software, typically in the form of floppy disk or cassettes, is programmed for specific types of computers. In

other words, if a program were developed for TRS-80 (Radio Shack), then it could not be used in an Atari or Apple computer. Programs would have to be developed for each type of computer used by constituents. At this time, many schools have Apple or TRS-80 computers but there is no national consistency. Many different manufacturers have given computers to schools in order to train students to use their brand at an early age.

Another future consideration is the creation of a research and training laboratory for electronic technologies. This new component of the National Center/National Academy could be funded, in part, by commercial producers of electronic technologies, telecommunication equipment, and software producers. The purpose of this laboratory would be to experiment and develop ways to use the audio, video, and computer technologies for professional, secondary, and postsecondary vocational training. Recently Mike Crowe proposed that such a laboratory would draw vocational educators, curriculum developers, vocational administrators, state department personnel, school board members, Job Training Partnership Act program developers, Private Industy Council members, and federal local administrators for training in interactive videodisc, computer literacy, software development, and teleconference techniques. It is therefore strongly recommended that the National Center/National Academy continue to pursue opportunities to fund a laboratory and use it to develop new ways to train constituents.

APPENDIX A

ASSOCIATIONS, CONSORTIA, AND NETWORKS

APPENDIX A

ASSOCIATIONS, CONSORTIA,
AND NETWORKS

Associations

Association for Educational Communications & Technology
1126 16th Street N.W.
Washington, DC 20036

Industrial Audio-Visual Association
P.O. Box 565
Downtown Station
Chicago, IL 60690

International Telecommunications Satellite Organization
490 L'Enfant Plaza, S.W.
Washington, DC 20024

International Telecommunications Union
Place Des Nations
Ch-1211
Geneva 20, Switzerland

Joint Council on Educational Telecommunications
1126 16th Street, N.W.
Washington, DC 20036

National Association of Educational Broadcasters
1346 Connecticut Avenue, N.W.
Washington, DC 20036

National Audio-Visual Association
3150 Spring Street
Fairfax, VA 22030

Society of Telecommunications Consultants
One Rockfeller Plaza
Suite 1912
New York, NY 10020

Tele-Communications Associations
424 S. Pima Avenue
West Covina, CA 91790

Training Media Distributors Association
1533 Wilshire, Suite 202
Los Angeles, CA 90017

Consortia

Alaska Instructional Communications Consortium
Learn/Alaska
221 E. Northern Lights Blvd.
Suite 210
Anchorage, AK 99504
Jane Denmert, Director
907/277-1638

Eastern Educational Consortium (EEC)

Bergen Community College
400 Paramus Road
Paramus, NJ 07652
Philip C. Dolce, Executive Director
201/447-1500 ext., 250 04 251

Founded in 1973, the EEC includes forty-five two-and four-year public and private colleges and universities in five states--New York, New Jersey, Connecticut, Pennsylvania, and Delaware. EEC broadcasts television courses all over the country via cable interfaces. It produces some courses while others are from PBS. Videotapes of courses are also available and telephones are used extensively for student/faculty interaction. Consortium members pay $400 annually and supply extensive in-kind contributions. Members who offer the courses must also pay the producer of the telecourse $10 per enrolled student.

Instructional Telecommunications Consortium (ITC)

American Association of Community and
Junior Colleges
One Dupont Circle, N.W.
Washington, DC 20036

Founded in 1977, the one hundred and fifty two-year college members are from all sections of the country. ITC assists users and producers of media-based materials (e.g., TV or radio course) to plan curricula and product materials cooperatively. Specific services include publication of a catalog of available TV-and radio-based materials; publishing related research studies; serving as a clearinghouse for information such as copyright laws; offering training programs, workshops, and forums; and producing video and audio materials for promotions. Annual dues are based on full-time equivalent enrollments and range from $500 to $1,200 for single institutions, with associations or consortium paying $1,500.

National University Consortium for Telecommunications in Teaching (NUC)

University of Maryland University College
College Park, MD 20742
Adele Seeff, Assistant Director
301/454-6627

Created in 1980 to enable colleges to make use of instructional materials and teaching techniques developed for adult learners who prefer to learn at home. Fifteen colleges and universities from across the nation (e.g., Boston University, California State University) participate in NUC. The television components of NUC courses are transmitted via the WESTAR II satellite to

cooperating public broadcast stations for videotaping and later replay. Telephones are used extensively for interaction between students and tutors. NUC's goal is to enable participants to obtain a bachelor's degree in six and a half years by taking only NUC courses. Member institutions pay $3,000 for the first developmental year and $10,000 a year thereafter for full memberships.

National University Teleconference Network (NUTN)

204 Whitehurst
Stillwater, OK 74078
E. Marie Oberle, Coordinator
405/624-6606

Established in 1982, NUTN is a coalition of sixty-nine universities and one consortium of seventeen colleges joined together to develop a telecommunications system for higher education. Member institutions can use audio, satellite video, and computers to distribute continuing education programs (especially professional development) produced by member institutions. NUTN cooperates with private industry (e.g., VideoStar from Atlanta, Georgia) and other associations on national education programs. The annual membership fee is $2,000, which includes computer conferences but does not include the costs of the program, which vary.

Public Service Satellite Consortium

1660 L Street, N.W.
Washington, DC 20036
Polly Rash, Director of Marketing
202/331-1960

Provides networking, planning, and management services for ad hoc video conferences for non-profit and public organizations. Also offers consulting services. Consortium has over one hundred member organizations.

To Educate the People Consortium (TEP)

5229 Cass Avenue
Detroit, MI 48202
Otto Feinstein, Chairperson
319/577-2258

During 1980-1981 student enrollment in the twelve TEP colleges and universities was 23,000. The consortium's goal is to provide an interdisciplinary curriculum for students who have traditionally not had access to higher education. TEP institutions use various technologies, including broadcast television, cable television, videotape, and telephone to provide courses, conferences and workshops. Most of TEP's financing has been through grants (e.g., FIPSE, National Endowment of the

Humanities) although members pay $200 a year and pilot programs pay $100. Each institution funds its own local activities and contributes some services to the consortium as a whole.

Networks

Appalachian Community Service Network (ACSN)

1200 New Hampshire Avenue, N.W.
Suite 240
Washington, DC 20035
Harold Morse, President
Robert Sestili, Manager of Program Acquisition
202/331-8100

Operates the Learning Channel as an educational and information service that includes career skills, self-improvement, leisure activities, and college telecourses delivered via satellite and cable. Also offers program production and networking services for teleconferences as well as some engineering consulting.

Ohio Medical Education Network (OMEN)

The Ohio State University
Center for Continuing Medical Education
A-353 Starling Loving Hall
320 West Tenth Avenue
Columbus, OH 43210
Arthur A. Bartfay, Network Coordinator
614/422-4985

OMEN is a two-way physician's audio-teleconference network that offers thirty one-hour seminars annually. Membership is now 158 hospitals with over 2,000 physicians participating. The seminars are offered for continuing education credit and cover a wide range of topics presented by medical faculty. Member hospitals receive slides that are shown when the lecture portion is presented, class outlines, class notes, and posters to advertise upcoming seminars (see attached). Based on their size, member istitutions pay on a per-program rate, from 300 or more beds at $39 per program to $31 per program for 0-99 beds. Audio cassettes of each program are supplied for $6.50 each, while the slides are included as part of the membership fee.

U.S. Chamber of Commerce

1615 H Street, N.W.
Washington, DC 20062
Doug Widner, Satellite Network Manager
202/659-6201

Operates the American Business Network (BizNet) as a subscription TV network providing special programs, seminars, and video-conferences to subscribing members in the business sector.

APPENDIX B

VENDORS OF PRODUCTS AND SERVICES

APPENDIX B

VENDORS OF PRODUCTS AND SERVICES

Acoustical Room Treatment

Gibson Associates
Town Hill Road
New Hartford, CT 06057
Ralph Gibson, President
203/525-1852

Kamperman Associates, Inc.
1110 Hickory Trail
Downers Grove, IL 60515
George Kamperman

Amplified Telephone (Speakerphones)

American Bell, Inc.
1 Speedwell Avenue
Morristown, NJ 07960
Charles Wright, Staff Manager
201/898-3259

Centel Supply Company
770 North Cotner
Lincoln, NE 68505
402/467-5283, 800/228-4598

North Supply Company
600 Industrial Park
Industrial Airport, KS 66601
Account Manager
800/255-6888

Panasonic Company
1 Panasonic Way
William Kopp, Asst. General Manager/Account Manager for Telecommunications Products
201/348-7000

Radio Shack Corporation
1500 One Tandy Center
Ft. Worth, TX 76102
817/390-3011

Audio Teleconference Units

American Bell, Inc.
1 Speedwell Avenue
Morristown, NJ 07960
Charles Wright, Staff Manager
201/898-3259

Dantel, Inc,.
2291 North Argyle Avenue
Fresno, CA 93727
Carol Means, Representative, Sales and Order Entry
209/292-1111

Northern Telecom, Inc.
Displayphone Marketing
P.O. Box 1222
Minneapolis, MN 55440
Shawn Doyle
612/932-8153, 800/328-6760

Precision Components, Inc.
1110 W. National Ave.
Addison, IL 60101
Bill Gray, Vice President of Marketing
312/543-8780

Audio-Teleconference Units-Cont'd.

Teletek Sound Systems
41 Martin Lane
Elk Grove Village, IL 60007
Jay Long, Director, Sales Promotion
312/640-9600, 312/228-5444

Vidicom
Video Communications Division
742-D Hampshire Road
Westlake Village, CA 91361
Daryl Bevan, President

Cameras, Video

Hitachi Densi America, Ltd.
175 Crossways Park West
Woodbury, NJ 11797
Bernie Munzelle
516/921-7200

RCA Broadcast Systems
Front & Cooper Streets
Building 2-2
Camden, NJ 08102
609/338-3000

Sharp Electronics Corp.
Professional Products Div.
10 Sharp Place
Paramus, NJ 07652
Bob Garbutt, General Manager
201/265-5548

Sony Corporation of America
Video Products Division
(also Communications Product Division)
9 West 57th Street
New York, NY 10019
212/371-5800

Computer Conference Systems and Services

Advertel Communications Systems, Inc.
1030 Fountain
Ann Arbor, MI 48103
313/665-2612

Institute for the Future
2740 Sand Hill Road
Menlo Park, CA 94025
Robert Johansen, Director Program on Telecommunications and Computing
415/854-6322

Source Telecomputing Corp.
1616 Anderson Road
McLean, VA 22102
Nat Forbas, Director of Sales
703/734-7500

Consulting (Applications, Needs Assessment, Program Design)

Center for Interactive Programs, University of Wisconsin-Extension
975 Observatory Drive
Old Radio Hall
Madison, WI 53706
Lorne Parker, Director
Christine Olgren, Assoc. Director
608/262-8997, 608/262-2569

Institute for the Future
2740 Sand Hill Road
Menlo Park, CA 94025
Robert Johansen, Director, Program on Telecommmunications and Computing
415/854-6322

Consulting (Applications, Needs Assessment, Program Design)-Cont'd.

Organizational Media Systems
8700 Davis Boulevard
Fort Worth, TX 76180
Willard and Cinda Thomas
817/281-4126

Resource Management Consultants
Derry Professional Park
Birch Street
Derry, NH 03038
Jim Boudle, Program Specialist
603/434-2210

Telecommunications Research Group
Annenberg School of Communications
University of Southern California
University Park
Los Angeles, CA 90007
Lynn Svennings, Co-Director
213/743-7400

Teleconference Design Group
South Carolina ETV Network
2712 Millwood Avenue
Columbia, SC 29250
Ken Nickerson, Director
Judy Bates
803/758-7261

Earth Stations (Uplinks and Downlinks)

Discom Satellite Systems
4201 Courtney Road
P.O. Box 8699
Independence, MO 64054
Arthur Liebenthal, Vice President
816/836-2828

Satellite Reception Systems
2370 Morse Road
Columbus, OH 43229
Brad Berson, Manager
614/471-6118

Intervideo Network
2029 Century Park East
Suite 1860
Los Angeles, CA 90067
Sarah Livingston
Coordinator for Marketing and Program Development
213/522-0581

Hilton Communications Network 15
Central Park West
York, NY 10023
Bill Jackson
212/247-2120

Satellease
666 Dundee Road, Suite 1304
Northbrook, IL 60062
Larry Bracco, Executive Vice President
312/272-7791

National Public Radio
2025 M Street, N.W.
Washington, DC 20036
202/822-2000

Electronic Blackboard, Tablets, and Pens

American Bell, Inc.
1 Speedwell Avenue
Morristown, NJ 07960
Charles Wright, Staff Manager
201/898-3259

Decisions and Designs, Inc.
8400 Westpark Drive, Suite 600
McLean, VA 22101
Scott Randall, Manager of Teleconferencing Systems
Chuck Annis, Assistant Manager
703/821-2888

Future View
1832 18th Street
Washington, DC 20009
Thomas Hanrahan
202/393-1970

Optel Communications (formerly FTC Services)
90 John Street
New York, NY 10038
Abraham Zelkin, President
Sara Simon, Manager, Corporate Sales
212/669-9721, 212/669-9503

Vidicom
Video Communications Division
742-D Hampshire Road
Westlake Village, CA 91361
Daryl Bevan, President
213/889-3653

Equipment Distributors (Audio and Video Products, Wide Screens)

Colorado Video, Inc.
Bos 928
Boulder, CO 80306
Glen Southworth, President
Jim Dole, Marketing
303/444-3972

Colorado Video, Inc.
Suite 1020
1300 North 17th Street
Arlington, VA 22209
703/525-1447

Future View
1832 18th Street
Washington, DC 20009
Thomas Hanrahan
202/393-1970

Honeywell/Action
4401 Beltwood Parkway South
Dallas, TX 75234
Ricki Manley, Product Manager, Video Teleconferencing
Jeremy Van Pelt, Director, Marketing Support
214/386-3500

Panasonic Company
1 Panasonic Way
Secaucus, NJ 07094
William Kopp, Asst. Gen. Manager for Telecommunications Products
201/348-7000

Midwest Corporation
4410 Westerville Road
Columbus, OH 43229
Fred Hibbie, Manager
614/476-2800

Video-Teleconference Services (National)-Cont'd.

Holiday Inn Video Network
(Hi-Net Communications, Inc.)
3796 Lamar Avenue
Memphis, TN 38195
Fred Del Toro, Vice Pres./ Gen. Manager
Duke Fletcher, Manager, Sales and Marketing
Eileen Cassini, Manager, Video-Teleconferencing Services
901/369-5348

Public Broadcasting Service (PBS)
Confersit
475 L'Enfant Plaza, S.W.
Washington, DC 20024
Polly Greene, Director, Conference Services
Barbara Barks, Confersat
202/488-5084, 202/488-5000

VideoStar Connections, Inc.
3390 Peachtree Road
Atlanta, GA 30326
James Black, Jr., Executive Vice President
404/262-1555

Marriott Hotels
Marriott Drive
Washington, DC 20058
Kathy Jens, Director of Teleconference Sales
301/897-1615

Public Service Satellite Consortium
1660 L Street, N.W.
Washington, DC 20036
Polly Rash, Director of Marketing
202/331-1960

Wetacom
955 L'Enfant Plaza
Suite 7200
Washington, DC 20024
Reba Immefgut, Account Executive
202/998-2700

Video-Teleconference Services (International)

AT&T Long Lines
195 Broadway
New York, NY 10007
212/393-9800

British Telecom International
Data Marketing
IB 1.2.2.1, Holborn Centre
120 Holborn
London, England EC1N2TE

ITT World Communications, Inc.
67 Broad Street
New York, NY 10004
Bob Bussey
212/797-3300

British Telecom International
3rd Floor
43 Bartholomew Close
London, England EC1A7HP

Connex International, Inc.
12 West Street
Danbury, CT 06810
Susan Pereyra, President
203/797-9060, 800/243-9430

APPENDIX C

NATIONAL CENTER RESEARCH LIBRARY RESOURCES FOR ELECTRONIC TECHNOLOGIES

APPENDIX C

NATIONAL CENTER RESEARCH LIBRARY
RESOURCES FOR ELECTRONIC TECHNOLOGIES

Compiled by Naomi Jacobs
National Center Research Librarian

Current Journals

EC & TJ (Educational Communication and Technology Journal) Association for Educational Communications and Technology, Washington, DC.

Educational Technology: the Magazine for Managers of Change in Education. Educational Technology Publications, Inc., Englewood Cliffs, NJ.

E.M.M.S. (Electronic Mail and Message Systems). International Resource Development Inc., Norwalk CT.

High Technology. Technology Publishing Company, Boston, MA

Journal of Educational Technology Systems. (Society for Applied Learning Technology) Baywood Publishing Company, Inc., Farmingdale, NY.

Technology Illustrated. Technology Publishing Company, Boston, MA

Technology Review. Massachusetts Institute of Technology, Cambridge, MA

Today Magazine. Compuserve, Columbus, OH.

Books and Reports

Abram, Robert, and others. Technology Adaptation Processes and Outcomes: Implications for Educational Policies and Practices. Columbus, OH, 1981. VT 037 581

ACSN, The Learning Channel. ACSN, The Learning Channel. Washington, D.C., 1983 VT 037 427

Ashley, William, and others. Educational Initiatives to Improve Technology Adaptation, Productivity, and Economic Expansion in the Private Sector. Columbus, OH, 1981. VT 037 582

Becker, Henry Jay. Microcomputers in the Classroom--Dreams and Realities. Baltimore, MD: Johns Hopkins University, Center for Social Organization of Schools, 1982. VT 036 967

Botkin, James, and others. Global Stakes: The Future of High Technology in America. Cambridge, MA: Ballinger Publishing Company, 1982. VT 037 544

Bramble, William J., and others. Education on the Beam: A Progress Report on the Appalachian Education Satellite Project. 1975 VT 937 429

Bruman, Janet L. Communications Software for Microcomputers. California Library Authority for Systems and Services, 1983. VT 037 564

Campbell, Donald P. High Tech Revealed: A Guide for Employment and Training Professionals. Boston Massachusetts State Department of Manpower Development, 1982. VT 037 168

Coburn, Peter, and others. Practical Guide to Computers in Education. Reading, MA: Addison-Wesley Publishing Company, 1982. VT 037 766

Daynes, Rod, and Nugent, Ron. Designing and Producing for the Videodisc: A Progress Report. Corporation for Public Broadcasting, Washington, DC, 1980. VT 036 139

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Faddis, Constance, and Abram, Robert. Technology Changes: Implications and Resources for Future Policy. The National Center for Research in Vocational Education, Columbus, OH, 1981. VT 037 583

Gisi, Lynn Grover, and McCune, Shirley. Education for a High Technology Economy: Materials Prepared for Governors' Special Briefings, National Governors' Association Annual Meeting, August 8-10, 1982, Afton, OK. Denver, CO Education Commission of the States, Denver, CO, 1982. VT 037 347

Gueulette, David G., ed. Microcomputers for Adult Learning: Potentials and Perils. Chicago, IL: Follett Publishing Company, 1982. VT 037 555

Haigh, Robert W. Communications in the Twenty-First Century. New York: John Wiley and Sons, 1984. VT 037 511

Hall, Gene E. Issues Related to the Implementation of Computers in Classrooms: Where to Now? National Institute of Education, Washington, DC, 1981. VT 036 532

Hawkridge, David. New Information Technology in Education. Baltimore, MD: Johns Hopkins University Press, 1983. VT 037 668

Hills, Philip J. Trends in Information Transfer. Westport, CT: Greenwood Press, 1982. VT 037 667

Holland, Steven W. An Approach to Programmable Computer Vision for Robotics. Dearborn, MI Society of Manufacturing Engineers, 1977. VT 036 873

Honey, John B., and Ullmer, Eldon J. Educational Communications and Technology: An Introduction for Teachers. 2nd ed. Dubuque, IA: William C. Brown Company, 1975. VT 034 497

Howard, H. Philip, and Rothstein, Debra E. Employment Trends in Computer Occupations. Washington, D.C. U.S. Department of Labor, Bureau of Labor Statistics, Division of Occupational Outlook, 1981. VT 036 855

Hull, Dan M. Using a Technical Core for High-Technology Curricula. Waco, TX Center for Occupational Research and Development, 1982. VT 037 314

Information Dynamics. Communications Technology in Education and Training. Proceedings of the Fourth National Conference, March 15-17, 1982. VT 037 562

Informational Technology and Its Impact on American Education. U.S. Congress, Washington, DC, Office of Technology Assessment, 1982. VT 037 331

Jackson, H. L. W., and Wiechers, G., ed. Postsecondary and Vocational Education in Data Processing: Tomorrow's Needs for Computing Education and Training. New York: Elsevier North-Holland, Inc., 1979. VT 037 164

Jaffe, J. A., and others. Technologies of the 80's: Their Impact on Technical Occupations. Conserva, Inc., Raleigh, NC, 1982. VT 037 535

John, DeWitt, and Katz, Ruth. Organizing to Use a New Telecommunications Technology: Communications Satellites and Vocational Rehabilitation. Final Report. Denver, CO Center for SocialReseach and Development, University of Denver, Denver, CO, 1977. VT 037 688

Joiner, Lee M., and others. Microcomputers in Education: A Nontechnical Guide to Instructional and School Management Applications. Holmes Beach, FL: Learning Publications, Inc., 1982. VT 037 514

Kaye, Anthony, and Rumble, Greville. Distance Teaching for Higher and Adult Education. London, England: Croom Helm Ltd., 1981. VT 036 624

Lathrop, Ann and Goodson, Bobby. Courseware in the Classroom: Selecting, Organizing, and Using Educational Software. Reading, MA: Addison-Wesley Publishing Company, 1983. VT 037 756

Levin, Henry M., and Rumberger, Russell W. The Educational Implications of High Technology. Stanford University 1983. VT 037 529

Levin, James A. Computers in Non-School Settings: Implications for Education. Washington, DC National Institute of Education, 1981. VT 036 534

Lewis, Raymond J. Meeting Learners' Needs Through Telecommunications: A Directory and Guide to Programs. Carnegie Corporation of New York, New York, NY, 1983. VT 037 617

Lewis, Robert, and Tagg, E. D., eds. Computer Assisted Learning: Scope, Progress and Limits. New York: Elsevier North Holland, Inc, 1980. VT 037 363

Martin, James. Future Developments in Telecommunications. 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1977. VT 037 037

Martin, James. Telecommunications and the Computer. 2nd ed. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1976. VT 037 036

Morgan, Robert P., and others. Large-Scale Educational Telecommunications Systems for the U.S.: An Analysis of Educational Needs and Technological Opportunities. Washington University, St. Louis, Missouri, 1975. VT 037 672

Moursund, David. School Administrator's Introduction to Instructional Use of Computers. Eugene, OR: International Council for Computers in Education, 1980. VT 036 710

Naiman, Adeline. Microcomputers in Education: An Introduction. Cambridge, MA; Technical Education Research Center, 1982. VT 037 068

Neil, Michael W., Education of Adults at a Distance. New York: Nichols Publishing Company, 1981. VT 037 056

Newell, Sydney B. Introduction to Microcomputing. New York: Harper and Row, 1982. VT 037 755

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Olgren, Christine and others. Madison, WI University Center for Interactive Programs. The 1983 Teleconferencing Directory, 6th ed., 1983.

Paisley, William J., and Butler, Matilda, eds. Knowledge Utilization Systems in Education: Dissemination, Technical Assistance, Networking. Beverly Hills, CA: Sage Publications, Inc., 1983. VT 037 715

Percival, Fred, and Ellington, Henry, eds. Aspects of Educational Technology, Volume XV: Distance Learning and Evaluation. New York: Nichols Publishing Company, 1981. VT 037 054

Poirot, James L. Computers and Education. Austin, TX: Sterling Swift Publishing Company, 1980. VT 036 752

Preparing Students for High Technology Careers: Advanced Office Technology, Robotics, Computer-Aided Design, Energy Management Tech/Control, Laser Electro-Optics, Micro Electronics, Bio-Medical Electronics, Telecommunications. The National Center for Research in Vocational Education, Columbus, OH. VT 037 757

Public Vocational and Industrial Education and Training. Fourth International Learning Technology Congress and Exposition, February 22-24, 1982, Orlando, FL. Volume I. Warrenton, VA. Society for Applied Learning Technology, 1982. VT 037 026

Quinsaat, Marilyn G. Implementing Computer Technology in a Classroom Setting: An Anecdotal Report of Long Term Use. Washington, DC: National Institute of Education, 1981. VT 036 533

Rada, J. The Impact of Micro-Electronics: A Tentative Appraisal of Information Technology. Geneva International Labour Office, 1980. VT 037 222

Roddy, Dennis, and Coolen, John. Electronic Communications. Reston, VA: Reston Publishing Company, Inc., 1977. VT 037 042

Rosen, C. A., and Gleason, G. J. Evaluation on Performance of Machine Vision Systems. Dearborn, MI Society of Manufacturing Engineers, 1980. VT 036 864

Sigel, Efrem, and others. Videotext: The Coming Revolution in Home/Office Information Retrieval. White Plains, NY: Knowledge Industry Publications, Inc, 1980. VT 036 944

Smith, Christopher, ed. Microcomputers in Education. New York: John Wiley and Sons, 1982. VT 037 513

Smith, Peter R., ed. Computer Assisted Learning; Selected Proceedings from the CAL '81 Symposium Elmsford, NY (8-10 April 1981, University of Leeds, England). Elmsford, NY: Pergamon Press, Inc., 1981. VT 037 487

Southeastern Regional Council for Educational Improvement. Schooling and Technology. Southeastern Regional Council for Educational Improvement, Research Triangle Park, NC, 1983. VT 037 693

Southwest Educational Development Lab. R and D Speaks: Microcomputers and Education. Austin, TX, 1981. VT 037 449

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Talley, David. Basic Carrier Telephony. 3d ed. rev. Rochelle Park, NJ: Hayden Book Company, 1977. VT 037 039

Technology and Education: Policy, Implementation, Evaluation. (Proceedings, National Conference, January 26-28, 1981) Washington, DC: Institute for Educational Leadership, Inc., 1981. VT 037 163

Trott, Andrew, and others. Aspects of Educational Technology, Volume XVI: Improving Efficiency in Education and Training. New York: Nichols Publishing Company, 1983. VT 037 717

Tydeman, John, and others. Teletext and Videotex in the United States: Market Potential, Technology, Public Policy Issues. Menlo Park, CA: Institute for the Future, 1982. VT 037 035

U.S. Congress, Office of Technology Assessment. Technology, Innovation, and Regional Economic Development. Background Paper. Census of State Government Initiatives for High Technology Industrial Development, 1983. VT 037 689

Useem, Elizabeth. Education and High Technology Industry: The Case of Silicon Valley. Summary of Research Findings. Massachusetts University, Department of Sociology, 1981. VT 037 235

Useem, Elizabeth. Education in a High Technology World: The Case of Route 128. Northeastern University, Boston. Institute for the Interdisciplinary Study of Education, 1982. VT 037 236

Watson, Nancy A., ed. Microcomputers in Education: Getting Started. Tempe, AZ: Arizona State University, College of Education, 1981. VT 036 706

Weisel, Walter K. Robots--the Binding Link between CAD/CAM. Dearborn, MI: Society of Manufacturing Engineers, 1978. VT 036 876

Zorkoczy, Peter. Information Technology; An Introduction. White Plains, NY: Industry Publications, Inc., 1982. VT 037 676

APPENDIX D

SCHEDULE OF RELATED NATIONAL MEETINGS

APPENDIX D

SCHEDULE OF RELATED NATIONAL MEETINGS

Type of Meeting	Meeting Dates/ Location	Meeting Title	Sponsor/Contact
Communication Satellites	Jan. 8-11 Honolulu, HI	PTC '84: The Sixth Annual Pacific Telecommunications Conference on "Telecommunications for Pacific Development"	Pacific Telecommunications Council (808) 949-5752 and 941-3789
	Dec. 12-14	"The Challenge of Changing:" The First Annual Conference on Computers in Education	McGill University Faculty of Education and Others
Computer-Oriented Programs	Jan 20-21 Wellesley, MA	HERS - New England Sixth Annual Management Institute for Women in Higher Education	Wellesley College, HERS-New England Bette Woody (617) 235-9598
	Feb. 29-March 1-3	HERS-New England Sixth Annual Management Institute for Women in Higher Education	Wellesley College, HERS-New England Bette Woody (617) 235-9598
	May 4-5 Wellesley, MA	HERS-New England Sixth Annual Management Institute for Women in Higher Education	Wellesley College, HERS-New England Bette Woody (617) 235-9598
Educational Innovation	Dec. 11-14 New Orleans, LA	Southern Association of Colleges and Schools 1983 Annual Meeting: "The Challenge of Educational Change in Technology"	Southern Association of Colleges and Schools B.E. Childers (404) 897-6100

Type of Meeting	Meeting Dates/ Location	Meeting Title	Sponsor/Contact
Educational Innovation	Jan. 9-13 Sarasota, FL	"Applications of Technology in Education"	American Association of School Administrators (703) 528-0700
Educational Media	Dec. 11 Chicago, IL	"Creativity Illustrated"	Council for Advancement and Support of Education Donna Oren (202) 328-5917
	Dec. 17 San Francisco, CA	"Creativity Illustrated"	Council for Advancement and Support of Education Donna Oren (202) 328-5917
	Feb. 9 Boston, MA	"Creativity Illustrated"	Council for Advancement and Support of Education Donna Oren (202) 328-5917
Information Dissemination	April 14-19 Atlanta, GA	1984 NUCEA Annual Conference	National University Continuing Education Association (202) 659-3130
Microcomputers	Dec. 6-8 London, England	The Seventh International On-line Information Meeting	On-line Review of Learned Information 0865-730285
	Jan. 14 Colorado Springs, CO	Desktop Computing Workshop	Council for Advancement and Support of Education John Hall (202) 328-5914
	May 7-11 Washington, DC	22nd Annual AEDS Convention: "Capitalizing on Computers in Education"	Association for Educational Data Tom Koehler (301) 279-3537

Type of Meeting	Meeting Dates/ Location	Meeting Title	Sponsor/Contact
Microcomputers	June 21-22 Boston, MA	Fourth Conference on Microcomputers in Education and Training	Society for Applied Learning Technology (703) 347-0055
Technological Advancement	Oct. 13-15 Philadelphia, PA	"EduTech/East '83" National Educational Computer Conference and Exposition	Judco Computer Expos, Inc. Carol Houts (602) 990-1171 or (800) 528-2355
	Dec. 11-14	Southern Association of Colleges and Schools 1983 Annual Meeting: "The Challenge of Educational Change in Technology"	Southern Association of Colleges and Schools B.E. Childers (404) 897-6100
	Jan 2-7	Presidents Institute: "Presidential Leadership in an Information Society"	Council of Independent Colleges (202) 466-7230
	Jan. 20-24	1984 AECT Conference: "Technological Horizons: Human Perspectives"	Association for Educational Communications and Technology (AECT) (202) 466-4780
Telecommunications	Dec. 11-13 Chicago, IL	1983 CAEL National Assembly: "Building A Resource Network for Adult Learners"	Council for the Advancement of Experiential Learning (CAEL) (301) 997-3535
	Dec. 6-8 London, England	The Seventh International On-line Information Meeting	On-line Review of Learned Information 0865-730285
	Jan. 8-11 Honolulu, HI	PTC '84: The Sixth Annual Pacific Telecommunications Conference on "Telecommunications for Pacific Development"	Pacific Telecommunications Council (808) 949-5752 and 941-3789

Type of Meeting	Meeting Dates/ Location	Meeting Title	Sponsor/Contact
	Oct. 21-23 Minneapolis, MN	AASA Conference on Managing Educational Technology	American Association of School Administrators (AASA) (703) 528-0700
Training Methods	Dec. 11-15 San Francisco, CA	"Data Training '83" The Fourth Annual Conference on Information Training	DATA Training Loretta Lillios (617) 542-0146
	March 3-9 Pine Mountain, GA	Training Theory and Practice	NTL Institute (703) 527-1500

GLOSSARY

-A-

ACCESS. The act of obtaining data stored in the computer system.

AD HOC. Refers to a teleconference that uses facilities that are temporarily linked together for a specific meeting or event; implies a one-time or occasional use of a teleconference, as opposed to a permanent system or regular usage.

ADD-ON CONFERENCE. A telephone or PBX feature that allows a user to add a third party to a two-party conversation. Also referred to as three-way calling or a three-way conference.

ADVANCE ORGANIZER. A preview of a program's content designed to prepare the viewer for the information to follow.

AFTRA. The American Federation of TV and Radio Artists.

ALPHANUMERIC. An expression derived from the words "alphabetic" and "numeric," which means "including both numbers and letters."

AMBIENT NOISE. Background noise.

AMPLIFIED TELEPHONE. A general term for a "hands-free" telephone; e.g., a speakerphone.

ANALOG SIGNAL. An electromagnetic wave encoded so that its power varies continuously with the power of a signal received from a source (e.g., a source of sound or light).

ANALOG. A form of information that is represented by continous wave forms that vary as the source varies. Contrast with digital.

ASCAP. American Society of Composers, Authors, and Publishers.

ASCII. American Standard Code for Information Interchange. An eight-level code for data transfer adopted by the American Standards Association to achieve compatibility between data service.

ASPECT RATIO. The ratio of a picture height to width; in video, 3:4.

ASSEMBLE EDIT. To string together video segments recording audio, video, and control tracks for each.

ASYNCHRONOUS. Characteristic of any operation that is independent of a master clock or time signals; also refers to information that is sent or exchanged independent of any specific time.

AUDIOCONFERENCE. A teleconference employing only voice communication. Used interchangeably with audio-teleconference. See also Enhanced Audioconference.

AUDIOGRAPHICS. Refers to the transmission of graphics and text information over a narrow-band telecommunications channel, such as a telephone line or radio subcarrier.

AUDIOGRAPHIC CONFERENCE. See Enhanced Audioconference.

AUDIO SPEAKER-MICROPHONE UNIT. Equipment that usually includes at least one speaker, multiple microphones, and a telecommunications interface to accommodate a group of people in a teleconference.

AUDIO-TELECONFERENCE. Two-way electronic voice communication between two or more groups, for three or more individuals who are in separate locations.

AUTHORING LANGUAGE. A computer programming language designed for producing computer-assisted instruction.

-B-

BACK LIGHT. The light used to illuminate the back of someone's head to separate the person from the background.

BACKUP. A copy of programs or data that is kept in case the original is accidentally destroyed.

BANDWIDTH. The difference between the lowest frequency and highest frequency being transmitted in analog form. The bandwidth of a signal cannot exceed the bandwidth of the channel on which it is carried.

BASIC (Beginner's All-purpose Symbolic Instruction Code). A programming language frequently used with microcomputers.

BAUD. A rate of information flow. Given in bits per second (bps), the rate is the highest number of single elements (bits) that can be transferred between two devices in one second.

BETAMAX. A 1/2" cassette standard developed by the Sony Corporation. Also known as BETA.

BID. A price quoted for an object or service.

BINARY. Having two possible states such as "0" or "1" that correspond to the "on" and "off" states of computer circuitry.

BIT. A binary digit; the smallest unit of information a computer uses.

BIT RATE. The speed at which bit positions are transmitted, normally expressed in bits per second.

BIT STREAM. A continouous string of bit positions occurring serially in time.

BLOCKING. The establishing of positions and movements for persons on the set.

BRANCHING. A program style in which viewers are presented with or "branched to" different segments of the program, depending upon their responses.

BRIDGE. A device for interconnecting three or more transmission channels. There are audio bridges and data bridges. Some audio bridges are of the "meet me" variety; participants call in to them at a prearranged time. Others are operator-assisted; an operator calls the participants.

BROADBAND (WIDEBAND). A telecommunications medium that carries high frequency signals; includes television frequencies of 3 to 6 million Hertz.

BROADCAST. The one-way transmission of information.

BUFFER. A temporary storage facility used as an interface between system elements whose data rates are different.

BUMP DOWN. A dub onto a smaller-format tape.

BUMP UP. A dub onto a larger-format tape.

BYTE. A group of eight bits.

-C-

CABLE TELEVISION. A transmission system that distributes broadcast television signals and other services by means of a coaxial cable. Most cable systems have the potential for two-way communication in addition to broadcast television.

CAD SYSTEM. Computer-Aided Design System.

CAI (Computer-Assisted Instruction). The use of computer terrminals and courseware in instruction.

CAPTURED-FRAME TELEVISION. Television that is either slow-scan or freeze-frame variety.

CCITT. International Telegraph and Telephone Consultive Committee; an international group that establishes transmission standards for telecommunications.

CHARACTER GENERATOR. A keyboard device used to create letters, numbers, and simple characters in a video form.

CHARGE-BACK. A funding scheme in which a department runs on fees charged for its services.

CHIP. A small rectangle of semiconductor material that contains microminiaturized electronic circuits.

CIRCUIT. A means of both-way communication between two or more points.

CLOSE-CIRCUIT TELEVISION. A private system for transmitting television signals, such as a university TV network.

CLOSED-CIRCUIT TELEVISION. A distribution system using receiving sites physically wired to the source.

COAXIAL CABLE. A metal cable consisting of a conductor surrounded by another conductor in the form of a tube which can carry broadband signals by guiding high-frequency electromagnetic radiation.

COBOL (Common Business Oriented Language). A programming language used in business applications.

CODEC. A contraction of "coder-decoder." It is a device which converts an analog signal into digital form for transmission, and converts it back again at its destination. An important aspect of the encoding, especially for video conferences, is the removal of redundant information. The encoding may also involve the combination of different signals (e.g., video, audio and graphics) which will be separated again in the decoding process.

COLOR BARS. A standard test signal used as a reference when setting up equipment.

COMMON CARRIER. An organization (such as a telephone operating company) that provides communication services to the general public at nondiscriminatory rates, without control of message content.

COMMUNICATIONS SATELLITE. A "relay system" in orbit above the earth's surface for telecommunications signals such as voice, video, and data; requires earth stations to transmit and receive the signals at the ground locations.

COMPANY NEWS PROGRAM. A program following the broadcast journalism format containing news of a particular organization produced by and for that organization.

COMPRESSED VIDEO. Video images that have been processed to remove redundant information, thereby reducing the amount of bandwidth required to send them over a telecommunications channel. See Video Compression.

COMPUTER CONFERENCE. A teleconference in which participants communicate in a text mode, using keyboards to enter messages. Messages are processed (routed, stored, etc.) by a computer. Transmission is generally via a value-added network. Although messages may be exchanged in real time, the majority are usually stored until intended recipients next log in.

COMPUTER GRAPHICS. The alphanumeric and graphic information generated by a computer.

CONFERENCE CALL. A dial-up, operator-assisted telephone call that connects more than two individuals.

CONFERENCE TELEPHONE. A device including a loudspeaker and one or more microphones, which, when connected to the telephone network, allows a group of users to hear and be heard by others in a teleconference. There are many kinds of conference telephones: Some are portable; some employ "push-to-talk" microphones; some employ voice-switching to deaden the loudspeaker when the microphone is active.

CONSTRUCTED ANSWER. A "fill-in-the-blank" answer that must be remembered and spelled out rather than just selected from a list.

CONTINUOUS PRESENCE VIDEO. Refers to a type of video-teleconference that provides simultaneous and continuous pictures of all participants. The images are usually close range shots of the group and may be viewed on a large screen or on one or more monitors. Contrast with voice-switched video.

CONTROL PULSES. Electronic pulses used to synchronize and control video playback; these can be counted by an editing interface in order to identify relative places on a tape.

CONTROL ROOM. An area that contains audio and video controls, such as a mixer and a switcher for a TV studio.

CONTROL TRACK. A track on a tape of control pulses used to stabilize playback of the tape; sync track.

CONTROL UNIT (CONTROLLER). A device that links pieces of equipment and controls the signal processing functions; a unit that allows the user to operate a piece of equipment.

COURSEWARE. Computerized instructional materials used for computer-assisted instruction

CPU (Central Processing Unit). The section of the computer that controls its overall operation. The CPU carries out or processes instruction given to the computer.

CRAWL. To move text lines from the right to the left, as commonly seen on lighted signs.

CRT (Cathode Ray Tube). A video screen used to display data and graphics.

CUT. To replace one picture immediately with another; a "take."

CUT ON ACTION. To change shots while an action is taking place.

CUT-AWAY. A shot showing something other than what is in the previous shot, usually to cover up edits.

CUT-IN. A shot showing a tight close-up of something in the previous shot.

-D-

DATABASE. A collection of information that can be stored in the computer.

DATA ENTRY DEVICE. Equipment that will convert data in human-readable form into a code the computer can understand.

DATA PROCESSING. Operations performed on data to achieve a particular objective.

DEBUG. To locate, remove, and correct mistakes in a computer program.

DECIBEL. A unit of a logarithmic scale used for measuring the strength of a signal relative to some reference level. (The "loudness" of sound is often measured in decibels.) Since the number of decibels is ten times the logarithm (to the base ten) of the ratio of signal strength to reference level, an increase of ten indicates a tenfold increase in strength, an increase of twenty indicates a hundredfold increase, and so on.

DECODE. To convert data from a coded form into a human-readable form.

DEDICATED LINES. Leased telecommunications circuits that are devoted to a specific application; e.g., leased telephone lines used for a teleconference network connecting fixed locations.

DEDICATED MICROCOMPUTER. A device that has a single purpose, designed specifically for producing or playing back interactive video programs.

DESCRIPTOR. A word or phrase that describes a subject under which information can be found in an index.

DGA. Directors' Guild of America.

DIAL-ACCESS. A receiving system in which a viewer dials up a requested program, which is automatically started up and fed to that location.

DIAL-UP TELECONFERENCES. Using the public-switched telephone network to interconnect lines for a teleconference either with or without operator assistance.

DIGITAL SIGNAL. A signal encoded as a series of discrete numbers.

DIGITAL TERMINATION SYSTEM (DTS). A new transmission system that provides digital connections via microwave facilities from users' premises to shared earth stations. The system is intended to overcome the expense of local ends for users who do not have an on-premise earth station for satellite communications.

DIGITAL VIDEO MANIPULATOR. A special effects device that can control the size and position of a shot.

DIRECT BROADCAST SATELLITE (DBS). A satellite designed with sufficient power so that inexpensive earth stations can be used for direct residential reception.

DIRECTIONAL MICROPHONE. A microphone that detects and transmits sound from only a certain direction.

DISC or DISK. See Magnetic Disk.

DISH. An antenna designed to receive satellite transmission.

DISKETTE. A thin, flexible platter, similar to a 45-rpm record, coated with magnetic material and used to store information; a floppy disk.

DISPLAY TERMINAL. A device that is used to view information; usually a CRT (cathode ray tube) monitor or plasma panel.

DOMESTIC SATELLITE. A satellite that provides communication services primarily to one nation.

DISSOLVE. To gradually fade out one shot while simultaneously fading in another.

DOCUDRAMA. A program format in which actual events are recreated or dramatized.

DOCUMENTARY. A program format documenting a real event rather than creating a scripted one.

DOUBLE MIKE. The practice of using two microphones on a person as a precaution against failure.

DOWN LINK. A receiving site for satellite transmissions.

DROPOUT. "Glitches" or streaks in a picture caused by a breakdown in the tape coating.

DUB. To duplicate electronically.

DUPLEX TRANSMISSION. Transmission in which signals can flow in both directions at the same time.

-E-

EARTH STATION. The antenna ("dish") and associated equipment used for transmitting signals to and receiving signals from a communications satellite. Some stations transmit and receive; others only receive.

ECHO. A wave reflected with sufficient energy and delay to be perceived as distinct from the directly transmitted signal.

ECHO CANCELLER. A device used in satellite communications to eliminate echo in audio transmission.

EDITING CONTROLLER. A device that controls VTR's during the editing process; editing interface.

EDITING SCRIPT. A script marked up with location numbers of each segment on the raw footage for expediency in assembling the final program.

EDITOR. A VTR that can perform clean edits.

EDP (Electronic Data Processing). The processing of data mainly by electronic digital computers.

EFP. (Electronic Field Production) shooting video, generally with one camera out of the studio.

ELECTROMECHANICAL PEN. A device that has an electronic pen with a mechanical arm for producing freehand information that can be sent over a telecommunication channel, usually a telephone line.

ELECTRONIC BLACKBOARD. A device for converting the pressure of chalk writing or drawing on a board into a signal for transmission over a telephone circuit and for converting the signal into an equivalent image on a monitor at the destination. (The term usually refers to the Bell System's Gemini 100 Electronic Blackboard.)

ELECTRONIC COMMUNICATION. A general term referring to the transmission and reception of information in analog or digital form over a telecommunications channel.

ELECTRONIC EDITING. Rearranging and "cutting" segments by means of duplication.

ELECTRONIC MAIL. A system of electronic communication whereby an individual sends a message to another individual or group of people; includes computer mail and facsimile.

ELECTRONIC TABLET. A device that has a conductive surface and electronic pen for producing freehand or computer-drawn information that can be sent over a telecommunications channel, usually a telephone line. Often called a digitizing tablet when used with a computer system.

ENCODE. To convert data in a human-readable form into a code the computer can understand.

ENCRYPTION. The special coding, or scrambling, of a signal for secure communications; the signal must be decoded, or unscrambled, before it can be deciphered.

END LOOP (LOCAL LOOP). A communications circuit that extends from the customer to the local switching center, sometimes called the "last mile."

END USER. The ultimate consumer of service.

ENG (Electronic News Gathering). A production style using small portable equipment for high mobility in the field, as pioneered by broadcast news.

ENHANCED AUDIO CONFERENCE. A teleconference employing both audio and some electronically controlled or transmitted graphics; graphics may be provided by remotely controlled slide or microfiche projectors, slow-scan or freeze-frame television, or an electronic blackboard or table.

EQUALIZE. To filter an audio track to balance the reproduction of ranges of frequencies.

ERGONOMICS. The design of the human-machine interface for a particular piece of equipment; implies that human factors are incorporated into the design.

EXTERNAL SYNC. Sync provided by a generator in common to all the cameras and VTR's in a system.

-F-

FACSIMILE. A device that electronically transmits and reproduces page copies and documents via a telecommunications channel, usually a telephone line; sometimes called a telecopier.

FEDERAL COMMUNICATIONS COMMISSION (FCC). The U.S. regulatory agency for communications technology using the public airwaves.

FIBER OPTICS. A communications medium based on a laser transmission that uses a fiber, or thread-like material, which carries light.

FIELD. In television, the information about an image conveyed in the alternate (odd or even) scan lines. In the standard interlaced scanning system, two fields (one of odd, the other of even scan lines) are required for each frame.

FILE. A block of information which, when combined with others, makes up a group of related data on a disk similar to files as used in office work.

FILL LIGHT. The light used to fill in shadows on the side opposite the key light.

FILM CHAIN. A video camera, slide projector, and film projector in a unit designed to transfer film images to video.

FILM-STYLE SHOOTING. Shooting with one portable camera.

FIRST GENERATION. An original recording, not a copy.

FOUR-WIRE CIRCUIT. A circuit that has two pairs of conductors (four wires), one pair for the send channel and one pair for the receive channel; allows two parties to talk and be heard simultaneously.

FRAME. In television, the total transmitted information in a scanned image. One frame consists of two interlaced fields.

FRAME. One scanned video picture, appearing at one-thirtieth of a second during normal playback of a video program.

FREEZE-FRAME TELEVISION. Slow-scan television with the added feature that the image to be transmitted is "frozen" in a local memory prior to transmission. With slow-scan television, movement of the image during the transmission (which may take 30 seconds or longer) results in a blur. This problem is avoided with freeze-frame television.

FREEZE-FRAME VIDEO. (1) A device that transmits and/or receives still video pictures over a narrowband or mediumband telecommunications channel; (2) may refer specifically to a still frame video unit that "grabs" the image from the camera or other video source and "freezes" it in a fraction of a second. See Slow-Scan Video.

FREQUENCY. The rate at which a current alternates, measured in Hertz (cycles per second) on a telecommunications medium.

FULL-DUPLEX. A communication channel over which both transmission and reception are possible in two directions at the same time; e.g., a four-wire circuit.

-G-

GAIN. An increase in signal power in transmission from one point to another; usually expressed in decibels.

GEN-LOCK. To be "driven by" or accept the sync of another piece of equipment.

GIGAHERTZ. A billion Hertz (cycles per second).

GLITCH. A picture problem.

GRAY SCALE. The number of shades of gray that represent a monochrome picture.

-H-

HALF-DUPLEX TRANSMISSION. Transmission in which signals can flow in either direction, but in only one direction at a time.

HARD COPY. A printed document.

HARDWARE. Machinery, devices, or equipment.

HEADEND. A point of origin for cable distribution.

HELICAL SCAN. The way that most videotape is scanned by the heads.

HERTZ (HZ). The unit of frequency; one Hertz is equal to one cycle per second; named in honor of Heinrich Hertz, first to detect such waves in 1883.

HIGH-RESOLUTION GRAPHICS. A system that provides a greater resolution than the standard 525-line video image; allows more detailed graphics to be seen clearly; often refers to a system with a resolution of 1,000 lines.

HYBRID SYSTEM. A system that combines two or more communications technologies; e.g., a system that integrates freeze-frame video images and an electronic table for freehand drawings.

-I-

IATSE. International Association of Theatrical and Stage Employees.

IMAGE STORAGE UNIT. A device that stores frames of visual information, usually on magnetic discs.

IN-CUE. The beginning of a given portion of tape.

INDUSTRIAL VIDEO. Nonbroadcast video produced by an organization for instructional/informational use.

INSERT EDIT. To drop in video and/or audio segments on a tape that already has a control track.

INPUT. To transfer data from an input device (such as a terminal or card reader) to the computer's memory.

I/O (INPUT/OUTPUT). The passage of information into or out of the computer.

INSTRUCTIONAL DESIGN SYSTEM. A process by which instructional programs are designed, produced, and evaluated in a methodological manner.

INSTRUCTOR-CONTROL. Program design that assumes an instructor will control the program's presentation.

INTEGRATED SERVICES DIGITAL NETWORK (ISDN). A digital telecommunications channel that allows for the integrated transmission of voice, video, and data.

INTELLIGENT PROGRAM. A program with imbedded logic in which segments displayed can vary, depending on responses of the viewer.

INTERACTIVE MEDIA. Refers to telecommunications channels that allow the two-way exchange of information.

INTERACTIVE VIDEO. A program style in which the viewer must actively participate in the program and in which the presentation may vary depending upon the viewer's responses.

INTERCUTTING. Interspersing segments of several taped sequences to consolidate content and provide visual variety.

LOCAL AREA NETWORK. A private transmission network generally connecting offices within a building or a set of nearby buildings and usually designed to convey different kinds of traffic; e.g., voice, data, facsimile, and video.

LOCAL ENDS. Transmission links between customers' premises and trunk circuits, e.g., the connection to an off-premises earth station.

LOG. A description of the contents of a tape, scene by scene.

LOSS. In transmission, the decrease in the power of a signal due to resistance or impedance as it passes through a circuit or equipment.

LOW-LIGHT-LEVEL GAIN. A boost of sensitivity for a camera when operating in dim surroundings.

-M-

MAGNETIC CARD. A magnetically coated card on which data can be recorded.

MAGNETIC DISK. A flat, circular plate on which data can be recorded.

MAGNETIC TAPE. A tape on which data can be recorded.

MAIN STORAGE. The main memory of the computer; stores data that are being processed or used currently.

MAINFRAME. The central processing unit of the larger types of computers.

MASTER. The original tape and the VTR it is played back on when editing.

MECHANICAL EDITING. Physical cutting of a tape.

MEDIAGRAPHY. A list of media materials available on a given subject.

MEET-ME BRIDGE. See Bridge.

MEET-ME TELECONFERENCE. A teleconference that uses a "meet-me" (dial-in) bridge to interconnect telephone lines.

MEGAHERTZ. One million Hertz (cycles per second).

MEMORY. A computer's information storage capability.

MEMORY. Elements in the computer that retain instructions or data used by the central processing unit (CPU).

MEMORY. The ability to retain a given setting.

MENU. A list of symbols and functions that can be selected on a computer system.

MICROCOMPUTER. A type of computer that is smaller than both the minicomputer and the mainframe computer.

MICROPROCESSOR. A central processing unit on a chip, or a computer system designed around such a device.

MICROWAVE. High-frequency radio waves used for the transmission of audio, video or data. Requires a clear line of sight between transmitter and receiver.

MICROWAVE. Very short-wave frequencies used for point-to-point transmission; higher than those used by broadcast.

MINICOMPUTER. A type of computer that is larger than a microcomputer and smaller than a mainframe computer.

MODEL OF PARTICIPATORY MEDIA DESIGN. An instructional design system incorporating the participation of a program development team.

MODEM (Modulator-Demodulator). A device that modulates and demodulates a signal (varies its amplitude, frequency, or phase) for transmission over a telecommunications channel.

MONTAGE. A sequence of shots rapidly edited or mixed together to evoke a particular concept.

MULTIPLE BRANCHING. A programmed instruction format in which different responses cause the viewer to be "branched to" different corresponding segments.

MULTIPLEXER. A device which combines multiple signals for transmission via a common channel.

MULTIPLEXING. A technique used to transmit signals from different sources over a single channel at the same time.

-N-

NABET. National Association for Broadcast Employees and Technicians.

NARROWBAND. A telecommunications medium that carries lower frequency signals; includes telephone frequencies of about 3,000 Hertz and radio subcarrier signals of about 15,000 Hertz.

NARROWCAST. To distribute programming to a limited, well defined audience.

NEEDLE DROP. A measure or unit of music determined by how many times a selection is played or the "needle dropped" on the record.

NETWORK. A system of interconnected computer systems; uses terminals for communications.

NOISE. Unintended signal introduced by circuit components or natural disturbances.

NONBROADCAST VIDEO. Programming designed for limited access rather than broadcast distribution.

NTSC. The video standard used in the United States and several other countries.

-O-

OCR (Optical Character Recognition). The use of scanners to read typed or handprinted marks on paper, such as standardized test forms.

OFF-LINE. Not connected to the computer.

OFF-LINE EDITING. Editing using inexpensive systems, allowing you to do "straight" editing only, without special effects or without the control of a computer interface.

OFF-PREMISES SYSTEM. Refers to a teleconference room or equipment located outside of a user organization's facility; e.g. a video teleconference room operated by a vendor and available to the public for a fee.

OFF-THE-SHELF PROGRAMS. Commercially produced generic programs that can be rented or purchased.

OMNIDIRECTIONAL MICROPHONE. A microphone that detects and transmits sound from all directions.

ON-LINE. Connected to the computer.

On-LINE EDITING. Editing using VTR's with a computer interface, or with studio-type mixing and switching equipment.

ON-PREMISES SYSTEM. Refers to a teleconference room or equipment that is located within the user organization's own facility.

ONE-INCH. The width of videotape within which there are three formats: Type A, Type B, and Type C.

OPEN MICROPHONE. A microphone that is active, detecting and transmitting sound on a continuous basis.

OPERATOR-ASSISTED BRIDGE. See Bridge.

OUT-CUE. The end of a given portion of tape.

OUTPUT. Data transferred from the computer memory to a storage or output device (such as a printer).

-P-

PACING. The timing and segmenting of a program to control the rate of presentation.

PACKET-SWITCHED NETWORK. A network in which messages are divided into packets to which headers are added. The header includes information as to the destination and information necessary for the reconstruction of the message at its destination. The packets are transmitted separately from node to node through the network. At each node a computer determines the best onward routing. The separate packets may travel different routes from origin to destination. By increasing complexity, packet switching allows for an improved balance between network utilization and the avoidance of congestion.

PAL. A video standard used in Great Britain and several other countries.

PAN. To turn or swivel the camera from side to side.

PASCAL. A computer language used in business and scientific work, named after the French mathematician Blaise Pascal.

PERIPHERAL. An external or remote device in a computer system. Input/output devices, such as keyboards, printers, magnetic tapes, and magnetic disks, are peripherals.

PERIPHERAL. A "remote control" device sometimes used to accept viewer response.

PICTURE ELEMENT. One of many monochrome or color "dots" that comprise a television picture (also called pixel or pel).

PIN-REGISTERED CAMERA. A very precise film camera that exposes images in exact registration from one frame to the next.

PIXEL. A contraction of "picture element." At any instant, a video screen is a rectangular array of pixels, each of which has a particular level of illumination (and color, in the case of color television). A 525-line television image comprises approximately 330,000 pixels.

PIXILLATION. The cutting out of a certain percentage of frames in a sequence to produce a fast-moving, jumpy effect.

PLASMA PANEL. A device that is used to display information; it has two glass plates separated by neon gas that lights up in response to electronic signals.

PLOTTER. A computer output device that draws information, such as curves and lines, on paper.

POINT-OF-PURCHASE PROGRAM. One designed to be viewed alongside a product it demonstrates in a store.

POINT-TO-MULTIPOINT VIDEO CONFERENCE. An asymmetric or video conference in which all sites receive television images, but only one site can transmit them The audio component may be bidirectional or unidirectional. Television transmission is usually via a communications satellite; if the audio is bidirectional, it is likely to be transmitted via the public telephone network.

POINT-TO-POINT VIDEO CONFERENCE. A video conference between two sites, each of which can transmit and receive both television and audio.

PORT. A circuit in an electronic device for the input or output of signals.

PORT. A point of connection of a line to a bridge. The number of ports on a bridge is the maximum number of lines it can interconnect.

PREROLL. The backing up of a tape before the desired in-cue so that the VTR can get up to speed.

PRESS-TO-TALK MICROPHONE. A microphone that is activated by pressing a bar or button.

PRIVATE BRANCH EXCHANGE (PBX). A private switching system for interconnecting a customer's internal telephone lines (extensions) with one another and with the public telephone network.

PRIVATE VIDEO NETWORK. A video playback system set up by an organization to communicate to its various branch offices or affiliates.

PRODUCTION HOUSE. A company that rents out video studio and/or portable production gear.

PROGRAM. A set of instructions, arranged in sequential order, telling the computer to do a specific task or to solve a problem.

PROGRAM CONTROL. Program design that assumes the program will be viewed straight through, without intervention of an instructor or student.

PROGRAM FORMAT. The style in which a subject is covered: documentary, interview, demonstration, and so on.

-Q-

QUADRUPLEX. A method of videotape scanning using four heads, found on two-inch machines.

-R-

RANDOM ACCESS. The ability to select any one of several items in any order; e.g., random-access microfiche projector.

RAW FOOTAGE. Unedited tape footage.

REMEDIAL FRAME. A segment that provides further clarification of a concept not understood by a viewer.

REMOTE TERMINAL. A terminal that may be miles away and connected by telephone or other communication lines.

RESOLUTION. The picture sharpness; how much detail is reproduced.

RESOLUTION. The quality of a television image that allows the observer to distinguish detail. Resolution increases as the number of pixels, and hence number of lines, increases. In North America, 525 lines is the standard. There are, however, systems which display 1,000 or more lines; they are termed "high- resolution" systems.

ROLL. To move text lines from the bottom to the top of the screen as seen commonly in ending credits.

ROOM INTEGRATION. Refers to the design and/or construction of a total teleconference room, including the equipment, associated electronics and environment.

ROUGH CUT. An imprecise edit of a program without special effects.

RUN-DOWN SHEET. A log of segments to be edited together and their locations.

RUSHES. Recently recorded raw footage.

-S-

SAG. The Screen Actors' Guild.

SATURATION. The depth or richness of a color.

SCA-FM (Subsidiary Communications Authorization) An electronic technique that places the radio signal on the FM spectrum; these signals can only be picked up with special tuners that distinguish the SCA from the FM signals.

SCAN CONVERTER. A device that converts one video standard to another.

SCANNING AREA. The area of a shot actually scanned or reproduced by the camera.

SCREEN DENSITY. The maximum number of accessible screen elements in a video display.

SCREEN FORMAT. The number of rows and columns in an alphanumeric display.

SECAM. A video standard used in France and several other countries.

SECOND GENERATION. A copy of a first-generation original tape.

SEMICONDUCTOR. Material chemically treated to have electronic characteristics.

SHARED VISUAL SPACE. Refers to a system's capacity to allow participants to interact with a common graphics display area; e.g., any person can change a display element and that change is seen by all participants at all locations.

SHOOTING RATIO. The ratio of total tape shot to that actually used in the final production.

SHOOTING SCRIPT. The script broken down into locations and talent needed, so that similar scenes can conveniently be shot together.

SHOT SHEET. A rundown of shots in sequence for a given camera for a studio taping.

SIGNAL-TO-NOISE RATIO. The ratio of a desired signal to an unwanted signal (static or noise).

SIGNAL. Information which has been encoded, usually in electromagnetic form, for the purpose of transmission.

SIMPLEX TRANSMISSION. Transmission in which signals can flow in only one direction.

SINGLE BRANCHING. A programmed-instruction format in which all wrong answers are treated in the same way. by branching to a single given segment.

SLATE. A board or card on which program identification information is written.

SLAVE. The machine recording the output of a master machine.

SMALL FORMAT VIDEO. Smaller, less expensive video equipment generally used for nonbroadcast purposes.

SLOW-SCAN TELEVISION. A means of transmitting a still video image via a channel of a lesser bandwidth than is required for regular motion video. Typically this is a 3-kilohertz channel (i.e., a regular telephone connection). The information comprising the image is "trickled" down the channel and reassembled as a still frame at the destination. Resolution may be traded off against transmission time, but thirty seconds is typical for a black-and-white system; color images require more time.

SMPTE TIME CODE. An address in digital time readouts used to identify exact places on a tape.

SOFT COPY. Output that is not in printed form, such as a display on a video screen, or audible output.

SOFTWARE. A set of programs, procedures or related documentation associated with a system; materials for use with audiovisual equipment; programs in contrast to equipment.

SPECIAL EVENT TELECONFERENCE. Refers to a teleconference that uses facilities that are temporarily linked together for a specific event; implies a temporary satellite network for one-way video and two-way audio. Also called ad hoc teleconference.

STANDARDS CONVERSION. The duplication of a tape into another video standard--for instance, NTSC to PAL or PAL to SECAM.

STEP. To go through a program frame by frame.

STILL-FRAME. The capturing and playback of a single video frame to stop or "freeze" action.

STORYBOARD. A script complete with pictures representing each shot.

SWITCHER. A device that takes in a variety of video inputs and selects or blends them, allowing you to cut, dissolve, super- impose, and so on.

SYNC TRACK. A track on a tape of control pulses used to stabilize playback of the tape; control track.

SYNCHRONOUS. Any operation where a series of events takes place under the control of a clocking device; also refers to information that is sent or exchanged at a certain time.

-T-

TAKE. A given recording of a scene.

TALKING HEADS. A rather disparaging term for a production consisting of static shots of people talking.

TANDEM BRIDGING. A group of two or more telephone bridges that are interconnected; provides the capacity to link a greater number of telephone lines.

TELECOMMUNICATIONS. The use of wire, radio, optical, or other electromagnetic channels to transmit or receive signals for voice, video, and data communications; communications over distance using electrical means.

TELECONFERENCE. A large meeting transmitted to a number of sites using satellite distribution.

TELEPATCHER. A device that interconnects ("patches" together) two or more telephone lines.

TELEPHONE CONFERENCE BRIDGE. A device that is designed to link three or more telephone channels for a teleconference; usually refers to a bridge that provides only dial-up teleconferencing where an operator calls each participant. Contrast with meet-me bridge.

TELEPROMPTER. A device that displays the script to the talent as a prompt during taping.

TELETEXT. A broadcasting service using several otherwise unused scanning lines (vertical blanking intervals) between frames of TV pictures to transmit information from a central data base to receiving television sets.

TELEWRITER. A general term that refers to an electronic device that produces freehand information that can be sent over a telecommunications channel, usually a telephone line.

TERMINAL. A device through which data may be entered or received, usually equipped with a keyboard and a display device.

TEST RECORDING. A brief recording made to test the correct operation of the equipment.

TIME-BASE CORRECTOR. A device that corrects minor electronic errors on a prerecorded tape.

TIME-LAPSE. The presentation, compressed into a short segment, of events that took place over a long period of time.

TOUCH SCREEN. A video screen that viewers can touch in various areas to register their responses.

TRANSCEIVER. A terminal that can both transmit and receive information.

TRANSMISSION CHANNEL. The medium by which a signal is sent and received between separate locations.

TRANSMISSION LOSS. The decrease in signal energy in transmission along a circuit due to resistance or impedance.

TRANSPONDER. The equipment on a satellite that accepts the signal sent from earth and, after amplifying and changing the frequency, sends it back to earth for reception; may be referred to as a repeater.

TRUCK. To move the whole camera right or left across an area.

TURNKEY SUPPLIER. A vendor or contractor that supplies all components and installation services required for an operational teleconferencing system.

TWEAK UP. To make fine adjustments.

TWO-SHOT. A shot containing two people.

TWO-WIRE CIRCUIT. A typical telephone circuit on the public switched network; a circuit formed by two conductors insulated from each other to provide a send-and-receive channel in the same frequency.

-U-

U-MATIC. Three-quarter inch videocassette tape or the type of player that uses that format.

UPLINK. A site sending signals up to a satellite.

-V-

VALUE-ADDED NETWORK (VAN). A network operated by a private company that "adds value" to basic telecommunications services leased from common carriers, and resells the enhanced services to end users. Examples are the packet-switched networks, Telenet, and Tymnet.

INTERFACE. The place at which two systems or pieces of equipment meet and interact with each other.

INTERFACE CARD. A circuit board inserted in a computer so that it can interface with a videotape or disc player.

INTERNAL SYNC. Synchronizing pulses supplied by an individual piece of hardware.

ISOLATION. The technique of recording each camera on a separate VTR; the tapes are then edited together in postproduction; also called iso.

ITFS (Instructional Television Fixed Service). A distribution technology using a special band of frequencies set aside for educational narrowcasting.

-J-

JUMP CUT. A joining of two segments that creates visual discontinuity.

-K-

K. one thousand twenty-four bytes of information that can be stored in the computer system; a computer that has 16K memory has a capacity of sixteen times 1,024 bytes of memory.

KEY. To electronically cut one image into another.

KEY TELEPHONE SYSTEM. Refers to a multiline telephone terminal; lines are usually accessed by push button and may be central office lines, foreign exchange lines, private lines, and so forth.

KILOHERTZ. One thousand Hertz (cycles per second).

-L-

LASER-OPTICAL. A videodisc format.

LASER-REFLECTANCE. A videodisc format.

LIGHT PEN. A pen-like device that contains a photosensitive cell and small aperture lens that produces or detects electronic signals; can be used to write freehand directly on a TV screen, or to enter, edit, and position computer text or graphics.

LINEAR. A program style in which each viewer watches each segment of the program.

VCR. Videocassette recorder.

VDT (Video Display Terminal). See CRT.

VERTICAL BLANKING INTERVAL (VBI). Black bar line that is beneath regular television picture, used to receive teletext information.

VHD. A videodisc format.

VHS. A half-inch cassette standard used by JVC, Panasonic, RCA, and some other manufacturers.

VIDEOCONFERENCE. A teleconference in which full motion video is transmitted, as well as voice and maybe graphics. The video signal can be one way (from one point to many points) or two way (simultaneously connecting two or occasionally more than two sites). The term is also used by some to include teleconferences employing audio plus freeze-frame television. Used interchangeably with "video-teleconference."

VIDEO FORMAT. The size, housing, and recording configuration of video tape or disc and the type of playback hardware associated with it, such as 3/4" or 1" Type C.

VIDEO HARD COPY UNIT. A device that electronically reproduces video images on paper.

VIDEO POINTER. An electronic device that produces an arrow or symbol that can be positioned anywhere on a displayed image to point out or highlight information.

VIDEO-TELECONFERENCING. Two-way electronic voice and video communication between two or more groups, or three or more individuals, who are in separate locations; may be fully interactive voice and video or two-way voice and one-way video; includes full-motion video, compressed video and sometimes freeze-frame video.

VIDEO VERITE. A style of shooting in which the camera tries to capture real life without intrusion.

VIDEODISC. A hard disc that stores information in microscopic "pits" indented in the surface; provides a high-capacity storage medium of over fifty thousand frames of information; used to store and retrieve video, audio, and other information.

VIDEOTEXT. A service similar to teletext except that information is delivered by telephone channels and a user can interact with the database to select information for viewing.

VIEWER CONTROL. Program design that assumes an individual viewer will control the program's presentation.

VIEWFINDER. The small monitor on a camera giving the camera person the image of what is being shot.

VIRTUAL SPACE. Refers to a type of videoconference in which each participant is assigned a separate camera and is seen on a separate monitor, large screen, or assigned spatial area.

VOICE ACTUATED. The ability of a piece of equipment to become activated in response to the sound of a voice.

VOICE GRADE CHANNEL. A telephone circuit that carries signals in the voice frequency range of 300 to 3,000 Hertz.

VOICE SWITCHING. An electrical technique for opening and closing a circuit in response to the presence or absence of sound.

VOICE/DATA TERMINAL. A desktop device that has the combined capability for voice and data communications.

VTR. Video tape recorder.

-W-

WALK-THROUGH. A rehearsal in which talent and cameras assume scripted positions, but sometimes abbreviating actual dialogue.

WHITE-BALANCE. To adjust a color camera so that it "sees" and reproduces white correctly, thus also reproducing all other colors correctly.

WATS LINE (Wide Area Telecommunications Service). A type of telephone service in which subscribers pay a base rate rather than a charge per call. An in-WATS line allows anyone in a designated area to phone an 800 number and pay nothing for the call. An out-WATS line allows users to place outgoing long- distance calls.

-Z-

ZOOM. To change the focal length of a lens, giving the appearance of moving closer to or further away from an object.

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